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Vol. LXXVII.] [Part I.

JOURNAL

OF THE ROYAL STATISTICAL SOCIETY.

DECEMBER, 1913.

The COURSE *of* REAL WAGES *in* LONDON, 1900–12.

By FRANCES WOOD, B.Sc.
(*Grocers' Research Scholar in the Statistical Department of the Lister Institute of Preventive Medicine*).

[Read before the Royal Statistical Society, November 18, 1913, the President, Professor F. Y. EDGEWORTH, M.A., F.B.A., in the Chair.]

Introduction.—The period of severe industrial unrest through which we are at present passing is generally stated in the Press and elsewhere to be due to the fact that while of recent years the cost of living has increased considerably, wages have remained practically stationary. The object of this paper is to ascertain, as far as possible, the extent of the resulting decrease in the general prosperity of the working classes.

The figures generally quoted to show that the cost of living has increased very rapidly of late years are certain index numbers, published by the Board of Trade in their *Annual Abstract of Labour Statistics*, showing for London the change from year to year in the retail price of the principal articles of food. Since, however, these index numbers have been subject to a certain amount of criticism,[1] and since they are based upon a single record of prices, namely, "the only available continuous series of prices reaching as far back as the year 1892,"[2] it is doubtful whether they can be accepted, even for London, without further confirmation. Accordingly, an attempt has been made to obtain an independent series of figures for London, and with this aim in view records have been obtained of the prices charged by a number of London firms for the principal articles of food for the period 1900-12.[3]

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[1] See *Daily News*, October 9, 1911.

[2] See *Report of the Cost of Living Enquiry for* 1912. [Cd.-6955], p. xliii.

[3] It was not possible to obtain returns for years earlier than 1900.

During March, 1913, Mr. G. Stapylton Barnes, C.B., when giving evidence before the Royal Commission on the Civil Services, handed in a memorandum dealing with the change in the cost of living since 1900. This memorandum presumably contained the index numbers showing the change in the retail price of food published by the Board of Trade in their *Annual Abstract of Labour Statistics*, but, as a matter of fact, for nearly every commodity the figures differed slightly, and in some cases considerably, from those already published in the *Abstracts*. These revised figures were published again in the *Report of the Cost of Living Enquiry for* 1912, but in neither case were any reasons given for the various alterations. The revised figures have been quoted throughout this paper.

This is, I believe, the first time that a series of retail food index numbers has been prepared as the result of a private investigation. In 1902 Mr. G. H. Wood urged the desirability of undertaking such an investigation,[4] and in 1909 the same author published a series of index numbers showing the general level of retail food prices for each year of the period 1850 to 1900,[5] but the data upon which these figures were based were obtained, for the most part, from Board of Trade publications.

Last year Dr. Bowley also published a similar series of index numbers,[6] based upon his own general impressions and experience, but not upon actual statistical data.

Recently the Co-operative Wholesale Society has issued a return showing the cost to the Soceity, at wholesale prices, of what is called an "average family grocery order," for certain years from 1898 onwards.[7] These figures cannot, however, be regarded as giving the general level of retail prices for the years in question, since they represent changes in wholesale and not retail prices, and since they do not include changes in the price of meat and bread, upon which more than one-third of the working man's wages are spent.

To determine the change in the cost of living for the working man, we must know not only the change in retail prices, but also the extent of any change that may have taken place in working-class rents. An attempt, therefore, has been made to calculate this change.

The figures usually quoted to show general changes in wages from year to year are the wage index numbers, also published by the Board of Trade in their *Annual Abstract of Labour Statistics.* These figures apply to the United Kingdom as a whole, and cannot, therefore, strictly speaking be compared with food index numbers for London. A fresh series of wage index numbers for London has accordingly been prepared, based upon changes in wages in nine trades in all. These trades, it is estimated, include about one-half of all the manual workers in London. The wage index numbers published at various times by Dr. Bowley and Mr. G. H. Wood[8] cannot unfortunately be used, as in no case do they extend beyond the year 1904.[9]

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[4] "The investigation of retail prices," by G. H. Wood. *Journal*, 1902.

[5] "Real wages and the standard of comfort since 1850," by G. H. Wood. *Journal*, 1909.

[6] See *Daily News*, October 9, 1911.

[7] Given in the Preface to *Gold and Prices*, by Professor W. J. Ashley.

The subject-matter of the paper will now be dealt with in detail under appropriate headings, and the final results will then be summarised.

I. *Change in the cost of living in London*, 1900–12.

(*a*) *Retail prices.*—In order to obtain a series of index numbers for food, an attempt was made to procure from a number of London firms a complete record of the average yearly retail price of the principal articles of food since the year 1900. The firms approached were exceedingly kind in giving all the information possible, but as it does not appear to be the custom for business houses to keep records of retail prices for past years, the only available information was, in many cases, contained in certain yearly catalogues which had fortunately escaped destruction. For this reason some of the returns are very incomplete. From two firms, however, a complete record of average yearly prices was obtained for many commodities.

With the two exceptions noted, the majority of the food index numbers are based upon prices obtained from yearly catalogues, and not, as one would have preferred, upon an average of the prices quoted in a series of weekly or monthly price lists published during the year. This does not introduce any very serious error in the case of commodities the price of which is not subject to frequent fluctuations, but it may lead to misleading results in the case of commodities such as meat and bacon of which the price, especially in recent years, has changed often. Until about 1904 the price of these commodities remained constant over long periods, so that the prices quoted in the yearly catalogues are fairly representative for the year; but after 1904 prices changed so frequently that certain firms ceased quoting at all for these commodities in their yearly catalogues, as it was impossible to fix upon one price which would apply to any but a very short period. For this reason gaps will be found in the tables for such commodities from the year 1904 onward.

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[8] "Statistics of wages in the United Kingdom during the last hundred years." *Journal*, 1898–1906.

[9] The wage index numbers quoted by Mr. Rowntree in an article on "Industrial Unrest," in the *Contemporary Review*, for October 1911, were prepared by Dr. Bowley. These figures reached as far as the year 1910, but they could not be used for the present paper as they refer to the whole of the United Kingdom and not simply to London.

As it is the custom for each firm to publish its yearly catalogue at about the same time each year, the prices obtained apply, for any given firm, to the same season throughout the period and are, therefore, comparable from year to year.

A separate yearly index number has been worked out for every commodity from the returns made by each of the firms. These figures are given in Table I (see Appendix); gaps have been left where no returns were obtained, and those index numbers which are based upon an average price for the year have been marked with an asterisk.

The year 1911 has been taken as a base, since for that year the figures are certainly the most accurate, and a return was obtained for each commodity from every one of the firms.

Generally speaking it is not desirable to use a single year as a base, especially when different series of index numbers are to be compared, as any error in the figures for the base year will affect all the other index numbers.[10] For this reason, the average of a number of years is to be preferred as being less subject to error. In calculating the index numbers of individual commodities for the separate firms the average of a number of years could not be used; the returns were so very incomplete that it would have been impossible to choose even three years for which returns were obtained in every case. The objection to having a single year as a base largely disappears if the actual year chosen is a normal year and the index numbers for that year are calculated from accurate returns. In the present case the year chosen, namely, 1911, was probably quite normal, and certainly the returns for this year were as accurate as any obtained.[11]

The firms giving information have been divided into two groups:—Group 1: Firms dealing principally with working-class customers. Group 2: Firms dealing principally with middle-class customers.

---

[10] See "Modes of constructing index numbers," by A. W. Flux, M.A. *Quarterly Journal of Economics*, 1906–07; also *Elements of Statistics*, by A. L. Bowley, M.A. P. S. King and Son.

[11] For a general discussion of method see "The construction of index numbers to show changes in the cost of the principal articles of food for the working classes," by the present writer. *Economic Journal*, December, 1913.

Group 1.—This group contains Firms A, B and C. A and C are very important firms, doing an enormous working-class trade, with branches in every district in London and in most of the large towns throughout the country.[12] Firm B is confined to one district of London, where it does a large working-class trade. It consists of a central store, with many branches in the neighbourhood. Although the index numbers for this firm are not, as in the case of Firms A and C, based upon yearly averages, they are probably fairly representative, as the prices charged by this firm are changed as seldom as possible. From the year 1902 onward (the first year with returns for meat) the results obtained from the firms in this group should give a very fair measure of the change in the price of food for the working classes in London during the period studied.

Group 2.—This group contains Firms D, E and F. These are all very large firms, dealing principally with middle-class customers living in London and its suburbs. Only yearly catalogue prices could be obtained as a rule from these firms.

Firm Z was not included in either group as it seemed probable that its returns were not very reliable. They are based upon the October price for each year, and as all the prices charged by this firm fluctuate considerably from month to month, it is doubtful whether the prices charged during one month are representative of the whole year.

The following particulars apply to the five additional firms who made returns for bread:—Firms K and L do a very big middle-class trade from a large number of branches scattered over London. Firms G and H have large bread factories and sell bread to working-class and middle-class customers in and around London. Firm L is confined to one district of London, where it does a big working-class trade.

For milk it is comparatively easy to obtain reliable figures, since most of the big London dairies agree to charge the general public the same price; the index numbers for this commodity are accordingly based on the change that has taken place in the price charged by this combination of firms.

On examining Table I and comparing the index numbers of the different firms for the same commodity, we find that although the direction of the change is the same for the whole period, there is considerable disagreement as to the extent of the change from year to year. This may be due to the fact that many of the numbers are not based upon yearly averages, or it may be that the variation in the price of any article is not the same even for firms who cater for approximately the same class of customer. The index numbers for bread are almost all based upon average yearly prices, yet we still find the same disagreement between one firm and another, although, *a priori*, one would not have expected this to be the case with a commodity such as bread. Further, the index numbers for Firms A and C are all based upon yearly averages, and we again find this divergence, in spite of the fact that both firms deal with the same class of customer. It seems probable, therefore, that these differences are not due in any great measure to faulty data, but that they actually represent the real state of affairs; in fact, considering the widely varying methods by which different firms conduct their businesses, such differences as these seem bound to occur.

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[12] Firm A only sells meat at its chief branches.

From the index numbers for the various commodities given in the first table, series of average index numbers were calculated for the firms in Groups 1 and 2 respectively. It was hoped in this way to obtain index numbers for the different articles representative of firms dealing both with working-class and middle-class customers. These average index numbers are given in Table II (see Appendix), and for comparison the Board's index numbers of retail food prices in London are also quoted.

On examining this table we again see a general agreement in the trend of the various series of figures, with marked differences for individual years. For many commodities the two new series of index numbers agree with one another better on the whole than they do with the Board of Trade figures, and in the cases where this is not so, *e.g.*, cheese, sugar and tea, the Board's figures agree better with those of Group II, *i.e.*, firms dealing with middle-class customers.

The best agreement between the index numbers for the two groups of firms is shown in the case of English beef, English mutton, bacon, butter, rice and bread, although the agreement is not very close.

With the exception of bread, which is dealt with later, it did not seem profitable to make a detailed comparison in the case of individual commodities, since the figures obtained during the present investigation are admittedly subject to a certain amount of error. A comparison will, however, be made between the various general index numbers, representing the level of prices as a whole for each year.

To obtain these figures a general index number was worked out for each of the two groups of firms, the index numbers of the separate

TABLE III. LONDON. *Index numbers of the general level of retail food prices** 1900-12. (1911 = 100.)

Year.	Working class firms. Group I.	Corresponding Board of Trade figures.	Commodities for which no return was obtained, and so omitted when calculating the Board of Trade figures.	Middle class firms. Group II.	Corresponding Board of Trade figures.	Commodities for which no return was obtained, and so omitted when calculating the Board of Trade figures.
1900	93	90	Beef, mutton, pork, flour, rice.	94	91	Butter, bacon.
'01	93	91	Beef, mutton, pork, flour, rice.	95	91	Pork, butter, bacon.
'02	97	94	Flour, rice.	93	93	Butter.
'03	94	94	Flour, rice.	95	94	Butter
'04	94	93	Flour, rice.	99	95	Pork, butter, bacon.
'05	96	95	Flour, rice.	97	95	Pork.
'06	96	91		96	91	Pork.
'07	96·5	96		94	97	Beef, mutton, pork, butter.
'08	98	98·5		98	99	Pork.
'09	99	100		100	100·5	Pork, butter.
'10	98	101·5		101	102	Pork.
'11	100	100		100	100	
'12	101	105		103	105	

*Based upon the index numbers for individual commodities given in Table IIA.

commodities being weighted according to the extent to which they enter into the consumption of the ordinary working-class family; the results are given in Table III. The weights, which are those used by the Board of Trade in constructing their index numbers, were very kindly supplied by the Labour Department. For some years in each group no return was obtained from any firm for certain commodities. In that case the sum of the weighted index numbers for that year was compared with the sum obtained for 1911 after omitting the article or articles in question. For both groups of firms a corresponding index number, calculated from the Board of Trade figures, is also given, using for any particular year the same articles as those upon which the general index number for the particular group is based.

The new index numbers agree fairly well with the Board's figures for the earlier years, although the latter show a considerably larger increase over the whole period than either of the series obtained during the present inquiry. The figures for the two groups cannot be compared, as they are not, in all cases, based upon the same articles. In order to make this comparison possible, a fresh series of index numbers was worked out, using in all three cases the same articles for any given years; these results are given in the following table:—

TABLE IV.—LONDON. *Index numbers of the general level of retail food prices for working-class and middle-class firms with corresponding Board of Trade figures*, 1900-12.* (1911 = 100.)

Year.	General index numbers for working-class firms. (Group I).	General index numbers for middle-class firms. (Group II).	Corresponding Board of Trade index numbers (revised).	Commodities for which no return was obtained either for Group I or Group II and so omitted when calculating the other index numbers.
1900....	93	94	90	Beef, mutton, pork, butter, flour, rice, bacon.
'01....	93	95	89	Beef, mutton, pork, butter, flour, rice, bacon.
'02....	97·5	93	93·5	Butter, flour, rice.
'03....	95	95	95	Butter, flour, rice.
'04....	98	99	95	Pork, bacon, butter, flour, rice.
'05....	96	96	95	Pork, flour, rice.
'06....	95·5	96	94	Pork.
'07....	96	94	96	Beef, mutton, pork, butter.
'08....	98	98	98·5	Pork.
'09....	100	100	100	Pork, butter.
'10....	98	101	101·5	Pork.
'11....	100	100	100	
'12....	101	103	105	

---

* Based upon the index numbers for individual commodities given in Table IIA.

On examining this table we see that, except for the years 1902 and 1910, the two new series of general index numbers agree with one another fairly well, and distinctly better than does either with the Board's figures. For the whole period, *i.e.*, 1900–12, the working-class firms show an increase of about 9 per cent., the middle-class firms an increase of about 10 per cent., and the Board of Trade an increase of over 16 per cent. It is a little doubtful whether any reliable conclusions can be drawn from a comparison between these three series of figures, because they are based, especially for the earlier years, upon few commodities. To obtain, therefore, a continuous series of index numbers for each commodity, the returns from all firms (working-class and middle-class) have been combined. The figures given in Table IV show that there is no marked difference between the general index numbers for the two types of firms, and suggest that probably one is justified in combining the returns, although if sufficient data were available one would prefer to keep them separate. In order to compare these figures (obtained by combining the returns of all firms) with the Board of Trade index numbers without the possibly disturbing influence of a single year as base, they have been recalculated taking the average of the years 1900–11[13] as equal to 100, and the corresponding Board of Trade figures for wholesale and retail prices have been recalculated, using the same base. The actual figures are given in Table IIB (see Appendix).

On the whole, the two series of retail index numbers do not agree very closely in the extent or even in the direction of the change from year to year, although they show the same general trend over the whole period. The same remark also applies to a comparison between the retail and wholesale figures.

Average index numbers for bread for both groups of firms were calculated on the new basis, as it is the only individual commodity for which sufficiently accurate and numerous returns were obtained to make a profitable comparison of the relative merits of the different series of index numbers. Of the nine firms making returns, seven were able to give the date and extent of every change during the period. Further, the trade of seven of these firms reaches into practically every district of London, so that the average index numbers should give an accurate measure of the variations which have taken place in the price of bread in London since 1900. The

[13] Originally index numbers were obtained for the period 1900–11, and the average of the whole period was taken as a base. Since then index numbers for 1912 have been added without changing the base. This is also the case with the index numbers of wages, &c.

Board of Trade index numbers for bread are also based upon the continuous returns of a large number of London firms, and in the circumstances it is surprising that the three series of index numbers should not agree more closely. Here again Groups I and II agree with one another better than does either with the Board of Trade (see Diagram 1).

Diagram 1.—*Index numbers of the retail price of bread in London*, 1900-12.

(*Average* 1900-11 = 100.)

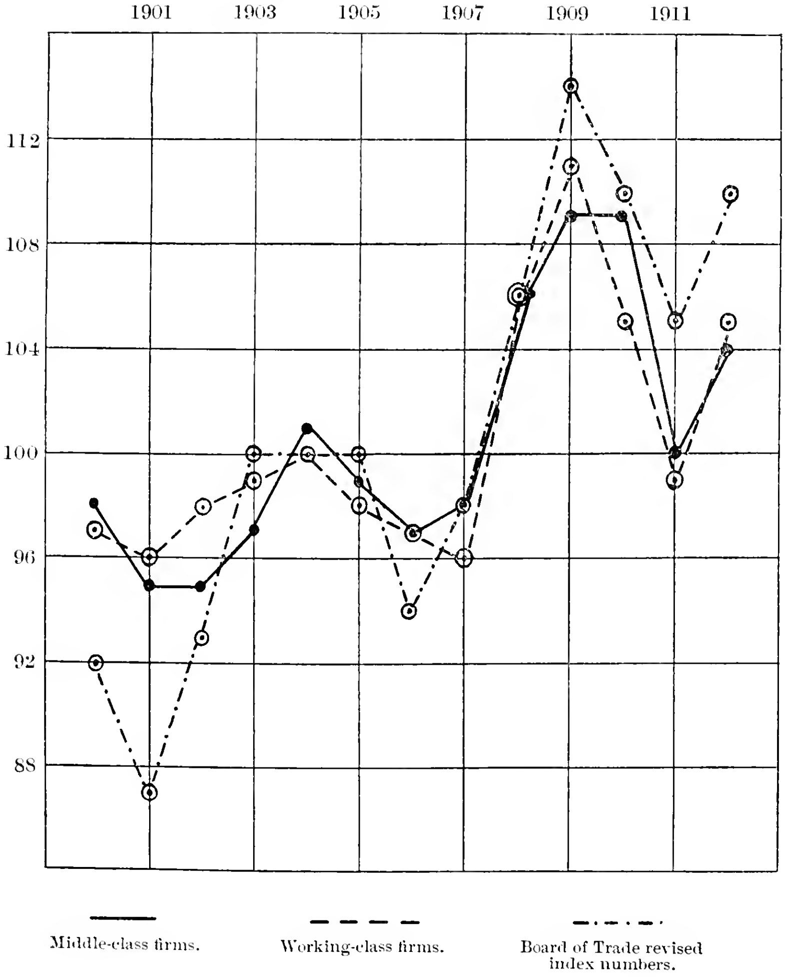


Diagram 2.—*Index numbers of the retail price of bread and flour in London for middle-class firms, and the Board of Trade wholesale index numbers for wheat*, 1900-12.

(*Average* 1910-11 = 100.)

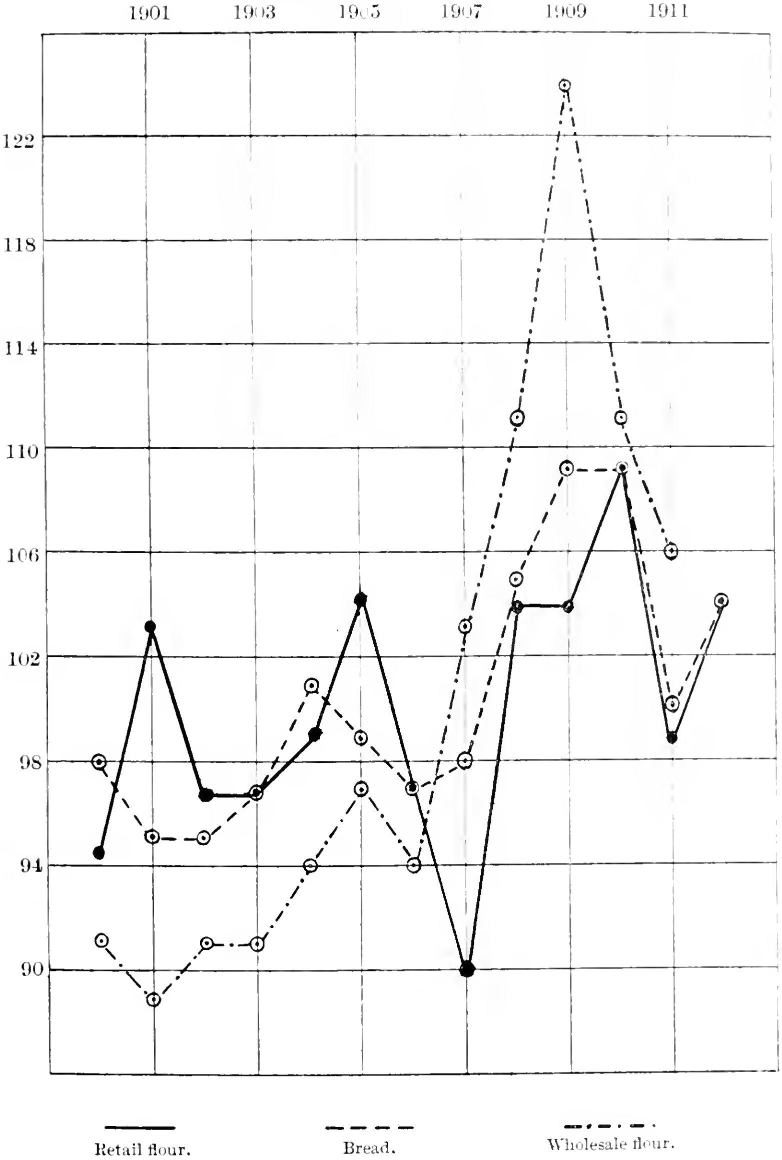
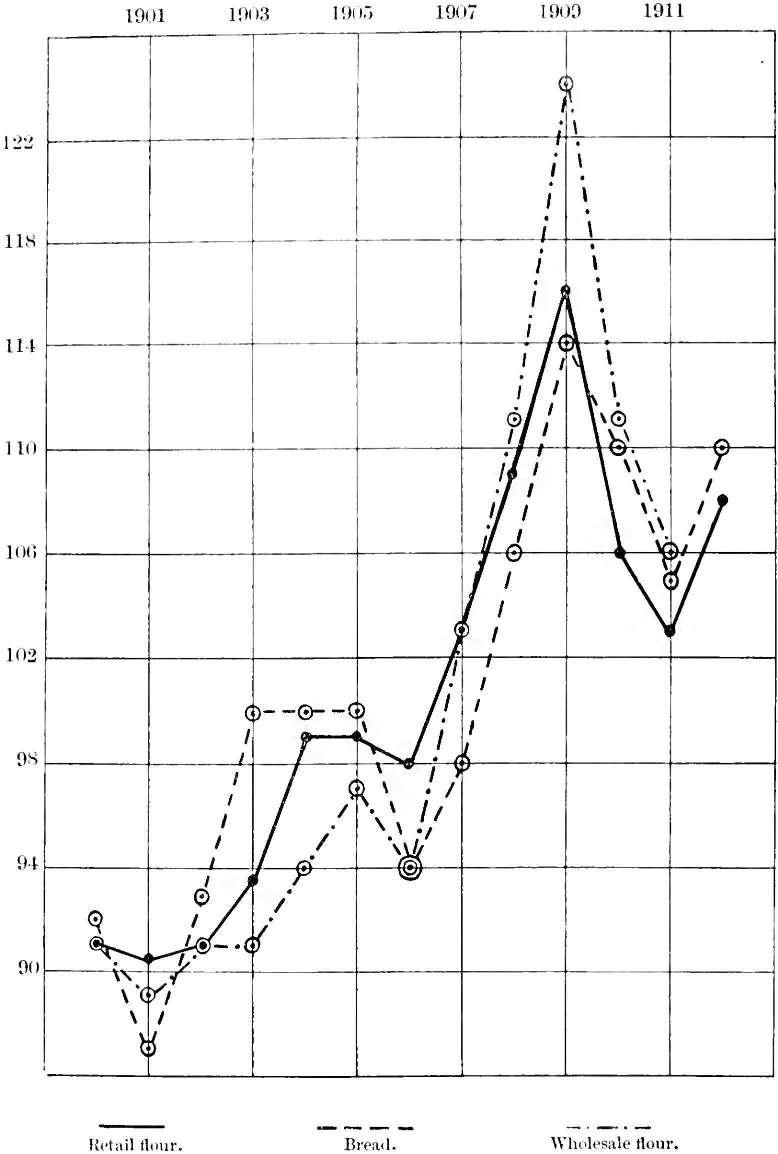


DIAGRAM 3.—*Revised Board of Trade index numbers of the retail price of bread and flour in London and of the wholesale price of wheat*, 1900-12.*

(*Average* 1900-11 = 100.)



* Given in *Report of the Cost of Living Enquiry for* 1912. [Cd.-6955.]

TABLE V.—*General index numbers of retail and wholesale food prices*, 1900-12. (*Average* 1900-11 = 100.)

Year.	Suggested general index numbers of retail food prices based upon the returns of all firms.*	Corresponding Board of Trade general index numbers * (London).		General index numbers for firm Z§ (London).	General index numbers for institution A (Cheshire).	General index numbers for institution B‖ (London).	Board of Trade's general index numbers of wholesale food prices (United Kingdom).	Sauerbeck's general index numbers of wholesale food prices¶ (United Kingdom).
		Original figures.†	Revised figures.‡					
1900	97·2	94·8	95·1	—	93·4	—	96·2	98·5
'01	97·1	96·3	96·2	97·9	101·5	98·4	96·6	95·6
'02	98·1	97·5	97·4	99·1	95·5	97·3	97·9	95·6
'03	98·1	98·1	98·2	95·7	95·3	96·9	96·9	94·2
'04	99·1	98·8	97·7	98·9	99·0	97·7	97·6	97·1
'05	100·2	99·6	99·4	99·2	101·6	99·7	97·4	98·5
'06	99·6	98·3	98·0	99·0	99·2	96·6	96·7	98·5
'07	99·3	100·0	100·1	100·1	99·7	97·4	101·1	102·7
'08	101·6	103·0	102·9	101·1	104·1	102·9	102·6	102·7
'09	102·5	104·1	104·2	102·0	103·0	104·4	104·6	104·1
'10	103·1	106·3	106·1	103·8	103·3	105·9	105·0	105·6
'11	103·8	103·2	104·5	103·2	104·3	102·8	107·4	107·0
'12	105·4	—	109·4	—	—	—	—	—

* Based upon the index numbers for the separate commodities given in Table IIB.

† Taken from *Fifteenth Annual Abstract of Labour Statistics*.

‡ Taken from *Report of the Cost of Living Enquiry for* 1912. [Cd.–6955.]

§ In calculating these index numbers the figures for bread for Firm D have been used. In this case the base used was the average of 1901-11.

‖ Average 1901–11 taken as base.

¶ *Journal*, 1912, p. 412.

Theoretically the price of bread should follow that of flour, and both should, one would imagine, follow the general trend of the wholesale figures for wheat, with less marked fluctuations from year to year. To discover whether any of the series illustrate these theoretical views, the "retail prices" index numbers for bread and flour for Group II and for the Board of Trade were plotted on Diagrams 2 and 3 respectively,[14] and on both diagrams the Board's wholesale figures for wheat were also plotted The figures for bread follow fairly closely those for flour in the case of Group II, and show the same general trend as the wholesale figures with less marked fluctuations. According to the Board of Trade, on the other hand, the retail price of both flour and bread follows very closely the wholesale price of wheat, showing nearly as marked fluctuations.

Finally, general index numbers based upon the returns of all firms are given in Table V, with corresponding Board of Trade figures based upon the same commodities. It should be noted that by taking all the firms together it is possible to obtain a series of general index numbers based upon changes in the price of practically all the articles commonly consumed by the working classes.

The new index numbers and the Board of Trade figures both point to a substantial increase in retail prices for the whole period, 1900–12; the former show an increase of about 8 per cent. and the latter of about 15 per cent. The new index number for 1900 is 2 per cent. higher than the Board's figure, for 1910 it is 3 per cent. lower, while for 1912 it is 4 per cent. lower. For every year the Board's figures point to a bigger increase since 1900 than the index numbers obtained during this investigation.

In this connection it is interesting to note that, in a letter to the *Daily News*, of October 9, 1911, Dr. Bowley made a similar criticism of the Board's retail index numbers for 1908 and 1910, and suggested a new series of figures based upon his own general impressions and experience. These figures are given in the following table, with the Board of Trade index numbers and those obtained during the present investigation calculated on a similar basis:—

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[14] Owing to the very incomplete returns obtained for flour it is not possible to do this for Group I.

TABLE VI.—*General index numbers of retail food prices in London*, 1900-12. (*Average* 1900-10 = 100.)

Year.	Suggested general index number.*	Dr. Bowley's general index number.†	Board of Trade general index number.‡	
			Original figures.	Revised figures.
1900	97·5	97	96	96
'01	97	98	97·5	97
'02	98	98	97	97
'03	98	99	99	99
'04	99·5	99	100	99
'05	100	99	99	99
'06	100	99	99	98
'07	100	100	101	101
'08	102	102	104	104
'09	103	102	103	104
'10	103	103	105	105·5
'11	104	—	104·5	105·5
'12	105	—	—	110

* Based upon the index numbers for the separate commodities given in Table IIB.

† Professor Bowley does not give a list of the commodities upon which his index numbers are based.

‡ Including eggs, potatoes, currants, raisins, tapioca, oatmeal, coffee, cocoa, jam and marmalade in addition to the commodities included in the "suggested" index number. These commodities have a weight of 64 out of a total weight of 360.

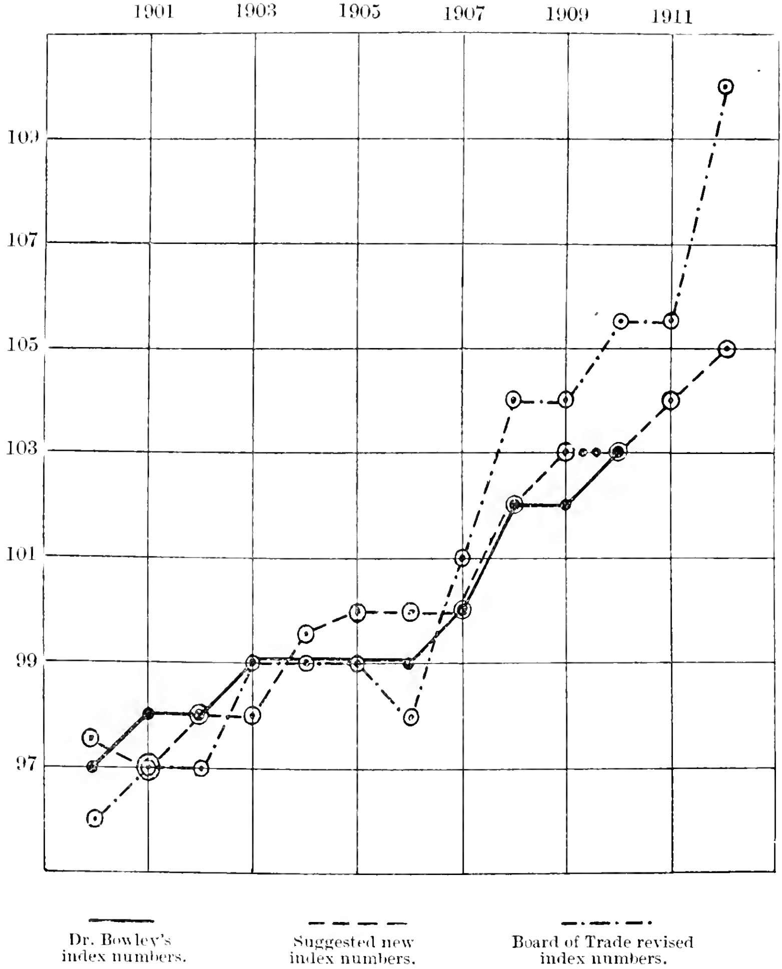
The agreement shown between Dr. Bowley's figures and those now obtained is very striking, for in no case do the figures differ by more than one unit. Both series point to an increase of about 6 per cent. between 1900 and 1910, while the Board's figures show an increase of about 10 per cent. for the same period. It seems possible, therefore, that the increase shown by the Board's figures is too large, since two perfectly independent calculations agree in fixing it at a lower figure (see Diagram 1).

Returning to Table V, general index numbers for Firm Z are given, which certainly do not differ as markedly from the other figures as one would have been led to expect from the striking differences shown for individual commodities.

Through the kindness of a friend it was possible to obtain index numbers showing the change in the "cost of living" for two small institutions. These numbers are also given in Table V, and although they do not agree very closely either with one another or with the other index numbers in regard to particular years, they show the same general features.

DIAGRAM 4.—*Index numbers of the general level of retail food prices in London*, 1900-12.

(*Average* 1900-10 = 100.)



The two series of general index numbers of wholesale food prices prepared by the Board of Trade and Mr. Sauerbeck respectively are given in the last two columns of the table. The numbers exhibit the same general trend as the retail figures, but they do not agree very closely with the retail figures, either in the direction or in the extent of change that they show from year to year.

Now that the Board of Trade have published the report of their inquiry into the cost of living in 1912[15] it is possible to make a further comparison, as they give in the report the "predominant price" both in 1905 and in 1912 of the principal articles of food in the chief industrial towns of the United Kingdom. The changes that have taken place in the retail price of the different commodities in London as shown by the "cost of living" figures have been calculated and compared with the changes shown by the Board of Trade's ordinary retail index numbers, and with those found as a result of the present investigation.

Table.—London. *Change in the retail price of certain articles of food between 1905 and 1912.*

Commodity.	Change according to the "cost of living" inquiries.	Change according to the Board of Trade retail prices index numbers.	Change according to the index numbers prepared during present investigation (all firms).
	Per cent.	Per cent.	Per cent.
English beef	+ 10	+ 11	+ 9·5
Foreign beef	+ 10	+ 29	+ 7·5
English mutton	+ 6	No change.	+ 2
Foreign mutton	+ 8	No change.	+ 2
Pork	+ 12	+ 5	+ 7
Bacon	+ 19	+ 22	+ 16
Butter	+ 10	+ 15	+ 7
Cheese	+ 19	+ 25	+ 15
Sugar	No change.	+ 3	− 6
Tea	− 1	− 5	No change.
Bread	+ 16	+ 10	+ 6
Flour	+ 14	+ 9	− 1
Milk	No change.	+ 2	+ 3
All the above commodities combined*	+ 9·8	+ 10·2	+ 5·3

* Each commodity is weighted according to the extent to which it enters into the ordinary working-class consumption.

Except for three commodities, *i.e.*, bread, flour and sugar, the new index numbers do not differ markedly from the "cost of living" figures, although in every case, with the exception of milk, they show a smaller increase. On the other hand, for certain commodities the Board's retail index numbers differ very markedly from the "cost of living" figures, *i.e.*, foreign beef, English and foreign mutton, &c., but in some cases the change is too big and in other cases it is too small, so that when the different commodities are combined to give a general figure, the increase of 10·2 per cent. shown by these index numbers agrees very well with that of 9·8 per cent. shown by the "cost of living" figures. On the other hand, the proposed new index numbers give a change of only 5·3 per cent. This marked discrepancy is largely due to the relatively small increase for bread and flour shown by the new index numbers. It is quite possible that the new figure for flour is incorrect, because the returns obtained for 1905 were not all that could be desired, but it is hard to believe that this is the case with bread, since the figures are based upon reliable returns from firms which, for the most part, serve customers living in all parts of London. It should, however, be noted that the "cost of living" figures are based upon returns for October, 1905, and October, 1912, and that the other figures are based upon average prices for the two years in question. There was no significant movement of prices during 1905, so that the October figures for that year are probably very similar to the average figures; but 1912 was a year of rapidly rising prices, and consequently the prices obtained for the month of October were undoubtedly considerably higher than the average prices for the year. For this reason we should expect that the "cost of living" figures would show a bigger increase than either of the other two series of figures. As a matter of fact the Board's retail index numbers point to a slightly bigger increase.

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[15] *Cost of Living of the Working Classes.* [Cd.–6955.]

From the somewhat incomplete data obtained during this investigation, it does not seem possible to answer definitely the following questions which have been raised :—

(1) Is there a marked difference in the variation in the retail prices charged by different firms dealing with the same class of customer: (*a*) for any particular article; (*b*) for commodities as a whole? It does not necessarily follow that if (*b*) is true (*a*) must also be true. The returns for Firm Z in fact show that, whilst the change in the price of individual articles does not follow the general change, the change in the level of the prices as a whole does follow more or less closely the general change observed for the other firms.

(2) Is there a marked difference in the case of firms not dealing with the same class of customer?

(3) What is the connection between changes in retail and changes in wholesale prices?

In order to answer these questions at some future time weekly and monthly records of retail prices from a number of firms are at present being collected.

(*b*) *Working-class rents in London.*—The most satisfactory method of discovering the change that has taken place in working-class rents over a given period is that used by the Board of Trade in their cost of living inquiries. For these inquiries records were obtained from a number of house agents of the change in the rent charged for the same house in a large number of cases. As it seemed improbable that a sufficient number of house agents would be willing to give this information to a private individual, another method was used for the present investigation. It is certainly a less exact method, but when it was used by the Board of Trade in an earlier investigation it gave results that agreed very well with those obtained by the first method.[16] In this case the change in the average rateable value of houses rated at less than 50*l*. per annum was used, allowance being made for changes in rates. This method takes no account of changes in the accommodation, &c., provided, or of the substitution of one type of house for another, but it does give a rough indication of the way in which working-class rents are moving.

There has been no analysis of rateable values for London since 1901, but since the assessments for Inhabited House Duty are based upon the same assessments, and represent the rent at which any property might reasonably be expected to let, the landlord doing all repairs, the necessary information can be obtained from the reports of the Inland Revenue Commissioners. These reports give for each year the number and total value of all assessments of private dwelling-houses assessed up to 10*l*., from 10*l*. to 20*l*., from 20*l*. to 40*l*. per annum, and so on. For this paper the change in the average assessment of London houses assessed at less than 40*l*. per annum has been used. This may be rather too low a limit if we wish to be quite sure that we have included all working-class houses. On the other hand, if we extend the limit at all it will have to be up to houses of the rateable value of 60*l*. per annum, which will certainly include many houses that are not inhabited by the working classes.[17]

The following table gives the average assessed value of all dwelling-houses in London assessed at less than 40*l*. per annum (whether they are exempt from the payment of Inhabited House Duty or not),[18] the average rates for London (excluding the City of London); and, finally, index numbers of the change in rents—(*a*) irrespective of changes in rates, and (*b*) when changes in rates are allowed for.

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[16] Second Fiscal Blue Book. [Cd.-2337], 1904.

[17] The final result is practically the same if 60*l*. is taken as the limit.

[18] Houses assessed at less than 20*l*. per annum are exempted from the payment of Inhabited House Duty. Rates have to be paid in all cases.

TABLE VII.—*Working-class rents in London*, 1901-12.

Year ending March 31.	Average assessment of dwelling houses assessed at less than 40*l.* per annum.	Average rates for London (in the £).*		Index numbers of changes in rents not including changes in rates.†	Index numbers of changes in rents including changes in rates.†
	£	*s.*	*d.*		
1901	23	6	6·63	99	96
'02	23·2	6	9·28	100	98
'03	23·1	7	2·80	99	99
'04	23·2	7	2·93	100	100
'05	23	7	3·77	99	99
'06	23	7	6·00	99	100
'07	23·2	7	6·47	100	101
'08	23·3	7	4·47	100	100
'09	23·5	7	5·24	101	102
'10	23·3	7	6·19	100	101
'11		7	7·11	100	101
'12	23·3	7	7·93	100	102

* Given for each year in *London Statistics*, published by the London County Council.

† Average 1901–11 = 100.

Owing to the delay in passing the Finance Act for 1909–10 the figures for 1909–10 are too small, and those for 1910–11 are correspondingly too big. Accordingly all assessments, &c., for the two years have been taken together and the mean used for both years.

No important changes in the law regarding assessments for Inhabited House Duty have been made, so that the figures are comparable from year to year, but the possibly disturbing effect of the following change must be considered. Up to the year 1907–08 an assessment might be made any time within one year of the year for which duty was due, but after 1907–08 this time was extended to "within three years." It had previously been the custom of the Commissioners to publish for any particular year the value of the assessments for that year, irrespective of the year in which the actual assessment was made. If this practice had been continued under the new regulations nearly four years would have had to elapse before their report for any year could have been published. In consequence of this after the year 1907–08 the amounts of all the assessments made in the year are given in the Annual Report, irrespective of the year to which the various assessments might relate.

The figures originally published for 1907–08 only represented the assessments made in and for that year. They did not include the assessments made in 1907–08 for the year 1906–07 (which had appeared in the previous Report), nor did they include assessments made in 1908–09 for 1907–08 (which appeared in the next Report). In consequence of this the original figures for 1907–08 were too small, and in order that they might be compared with other years they were increased in subsequent Reports by the estimated amount which would have been included had they been compiled according to the old system. For years after 1907–08 the Commissioners give in their Annual Reports, as already stated, the assessments made within the year, irrespective of the year to which they applied. This alteration has a disturbing effect upon the year immediately following it, but otherwise the numbers obtained by the old method are probably comparable with those obtained by the new. Even if this is not the case when comparing one year with another the change cannot have had any effect upon the general trend of the figures, which is really what we are concerned with rather than the value for any particular year.

The almost steady increase in rents which appears to have taken place in London during the last ten years, as shown by the index number in the last column of Table VII, is surprising, as one hears on all sides of falling rents, due it is said to the large increase in the number of small houses situated in the surrounding suburbs.

It was possible in the case of St. Marylebone and St. Pancras to compare the rents paid in 1900 and in 1911 for the same houses in about 120 cases. It was found that if the index number for 1911 was taken equal to 100, that for 1900 was 101·8. The house agent who kindly allowed this comparison to be made stated that in 1911 the houses were in better repair and had additional conveniences.

It is doubtful, therefore, whether, in calculating the change that has taken place in rents, the increase in rates should have been taken into consideration. It is quite possible that, with a falling demand for houses, landlords have had to bear the increase in rates themselves without making any corresponding increase in rents, and that those index numbers in which no allowance has been made for changes in rates represent more correctly the true state of affairs. At the best the figures only afford a rough indication of the direction in which rents are moving, and do not necessarily show the exact extent of the change from year to year.

(c) *The cost of living.*—Finally, to obtain figures representing the change in the cost of living for the working classes, index numbers must be calculated which combine changes in retail prices with changes in working-class rents.[19] This has been done, and the results are given in the following table:—

Table VIII.—*Index numbers of the change in the cost of living in London for the working classes*, 1900-12. (*Average* 1900-11 = 100.)

Year.	Index numbers of retail food prices.	Index numbers of rent.*	Index numbers of the cost of living.†
1900	97·2	99	97·5
'01	97·1	100	97·8
'02	98·1	99	98·4
'03	98·1	100	98·6
'04	99·1	99	99·2
'05	100·2	99	100·0
'06	99·6	100	99·7
'07	99·3	100	99·5
'08	101·6	101	101·5
'09	102·5	100	102·1
'10	103·1	100	102·5
'11	103·8	100	103·1
'12	105·4	(100)‡	104·3

* Not including changes in rates.

† In obtaining these figures food has been given a weight of 4 and rent a weight of 1.

‡ Returns not yet available for this year. It has been assumed that no change has taken place since 1911.

II. *Changes in wages.*

The Labour Department of the Board of Trade publish each year two reports dealing with changes in wages: (1) *Standard Time Rates of Wages in the United Kingdom*, which gives the standard time rate of wages in force for certain occupations in the chief industrial towns of this country. (2) *Changes in Rates of Wages and Hours of Labour in the United Kingdom*, which gives any changes in standard rates that have taken place during the year, as well as any change in wages in trades for which there are no standard rates. In both cases the approximate number of workers affected by the change is given.

As Dr. Bowley and Mr. G. H. Wood have pointed out, these two Reports do not give sufficient information for the calculation of accurate wage index numbers.[20] They show that for this purpose we ought to know: (1) The wages per hour, week, or piece of the ordinary wage earner and the number of hours, &c., worked during a unit of time; (2) the change in the standard rates of wages and the number of hours, &c., worked during the period studied, and the relation between changes in standard rates and changes in actual earnings; (3) whether there has been any movement from poorer to better paid trades or from poorer to better work inside any given trade or *vice versa*; (4) whether for men paid by the hour a reduction in the number of hours means a corresponding reduction in earnings. We ought also to know whether changes in the wages in the special grades selected by the Board of Trade for the calculation of their wage index numbers are really representative of changes in wages of the trade as a whole. Many of these points can only be settled by a comparison between periodic wage censuses, and the first part of this section will deal with a comparison between the wage censuses for 1886 and 1906, published by the Board of Trade, in order to obtain, if possible, an answer to some of these questions.[21] Unfortunately the building and engineering trades are the only two dealt with in sufficient detail in the earlier census to make this comparison possible.

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[19] The question of the change in the price of clothing and household utensils has not been dealt with owing to the great difficulty experienced in obtaining any data on this point, other than the personal impression of various retailers. Since, however, only a very small proportion of the working man's wages are spent in this way, the assumption that the price of these commodities has increased to the same extent as the price of food can only introduce a very small error.

(*a*) *A comparison between the wage censuses for* 1886 *and* 1906.[22] 1. *The building trade.*—The 1886 wage census contains details of the "full time" earnings, &c., for one summer week of 4,388 employees, and the 1906 Report contains similar details of 50,836 employees. Owing to the great difference in the number of workers represented in the two inquiries, the Board state in the 1906 Report that the two results cannot be compared. The 1886 census was presumably based upon a small sample of the building trade, and with caution one should be able to compare it with the 1906 census, which was based upon a larger sample, and draw at least some deductions from such a comparison.

The 1886 census was not published until 1893, and contained for the building trade details of the "full time" earnings, &c., of 7,768 employees for one summer week in 1891, in addition to the information for 1886.

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[20] "The statistics of wages in the United Kingdom during the nineteenth century (Part 14)". *Journal*, 1906, p. 148.

[21] When Dr. Bowley and Mr. G. H. Wood published the paper already referred to the wage census for 1906 was not published.

[22] *Rates of Wages Paid in the United Kingdom in* 1886. [Cd.–6889.] *Report of an Enquiry by the Board of Trade into Earnings and Hours of Labour of Workpeople of the United Kingdom in* 1906. [Cd.–5086.] [Cd.–5804.]

The Board of Trade wage index numbers for the building trade, published in the *Annual Abstract of Labour Statistics*, are based upon the change in the unweighted average of the standard time rate of wages of bricklayers, masons, and carpenters and joiners in the chief industrial towns in the United Kingdom, and accordingly are a measure of the change in the standard rates of these grades in the country as a whole. For comparison with this, the corresponding change in average "full time" earnings for these grades was calculated from the three wage censuses. The results obtained both for the United Kingdom and for London are as follows:—

TABLE IX.—*Changes in standard rates of wages and in actual earnings for bricklayers, masons and carpenters and joiners. (Full time for one summer week.)*

	1886.	1891.	1906.
United Kingdom—			
(*a*) Change in standard rates per hour	84·5	88	100
(*b*) Change in average earnings	93	97	100
London—			
(*a*) Change in standard rates per hour*	86	86	100
(*b*) Change in average earnings	93	89	100
(*c*) Change in standard weekly rate*....	90	90	100

* Taken from *Standard Time Rates of Wages in the United Kingdom.*

From this we see that in both cases standard rates per hour increased at a faster rate than average "full time" weekly earnings. This can be accounted for, to a certain extent, by the fact that between 1891 and 1906 a reduction was made in the number of hours that constituted a "full week." This caused a corresponding reduction in the "full time" earnings for 1906, making the change in average earnings appear to be smaller than the change in standard rates. It is probable that had we been comparing changes in average earnings of all workers, and not of "full time" workers only, we should have found a better agreement, as one is generally lead to suppose that a reduction in the hours of labour makes little difference in the long run in average weekly earnings; the reduction in the earnings of some workers being compensated for by the fact that for other workers overtime—for which they are paid at a higher rate—becomes more common. It was possible to obtain index numbers for London based upon the change in standard *weekly* wages, and the figures are given in the last line of Table IX. It will be seen that they agree fairly well with the index numbers based upon changes in average earnings, although they still show a somewhat larger increase.

It should be noted that the Board, in basing their yearly wage index numbers upon changes in standard rates of wages, tacitly assume that all the workers receive the increased rate, which, as an inspection of Tables A and B (see Appendix) will show, is certainly not the case. To take a single example, during 1900, the standard rate of carpenters and joiners in London was increased by ½*d.* per hour, and according to the Board of Trade only 20,000 workers received this increased rate, although there are approximately 30,000 carpenters and joiners over 20 years of age working in London. This may be an additional reason for the discrepancy between the two series of figures.

To discover whether the Board of Trade are justified in regarding changes in the wages of bricklayers, masons and carpenters and joiners as representative of changes in wages in the whole trade, we must discover whether, for the period 1886–1906, the average earnings of bricklayers, &c., changed, according to the three wage censuses, to the same extent as the average earnings of the whole trade for a constant distribution of workers in the trade. It is necessary to take a constant distribution of workers in order that any change in average earnings due to movement inside the trade from poorer to better paid work, or *vice versa*, may be eliminated. It is immaterial which distribution of workers is chosen as a standard, and in calculating the figures given in the following table the distribution of workers, given in the 1906 census for London and the United Kingdom respectively, has been used.

TABLE X.—*Change in average earnings for the whole building trade.* (*Full time for one summer week.*)

	1886.	1891.	1906.
United Kingdom—			
(*a*) Change in actual earnings as shown by the three wage censuses	90	92	100
(*b*) Change in earnings for a constant distribution of workers (1906 distribution)	91	96	100
London—			
(*a*) Change in actual earnings as shown by the three wage censuses	91·5	89	100
(*b*) Change in earnings for a constant distribution of workers (1906 distribution)	90·5	90·5	100

The figures given in the table show that, for a constant distribution of workers, the change in average earnings for the whole of the building trade was very similar to that found already for bricklayers, &c., only[23] (see Table IX). This is a little unexpected The bricklayers, &c., are certainly better organised than the bulk of the workers in the trade, and it is therefore surprising that their wages should not have increased at a faster rate. *A priori*, one would have been inclined to criticise the selection of these three grades by the Board of Trade as representative of the building trade on these very grounds, but certainly the evidence afforded by these figures appears to justify such a selection.

As "full time" earnings have been used throughout, it is impossible to determine the change, if any, in the amount of "time lost" in the three years. Changes in earnings due to changes in the amount of employment will be dealt with separately.

The wage census figures for London for the two earlier years are based upon so few returns that one would not be inclined to place any reliance upon them were it not for the fact that they show the same general tendencies as those for the United Kingdom.[24]

The result of the comparison between the three censuses may be summarised as follows :—

(1) The change in average earnings of bricklayers, masons and carpenters and joiners may be taken as representative of changes in average earnings of the building trade as a whole. When calculating the change in wages in this trade from 1900 to 1912, therefore, the changes in wages in these three grades will be taken as representative of the whole trade.

(2) The actual earnings per week of "full time" workers in these three grades have not increased as fast as have their standard rates of *wages per hour*, owing largely to the fact that during the period a substantial reduction in the number of hours constituting a "full week" took place. In the case of London it was found that there was not a very significant difference between changes in *weekly* earnings and changes in *weekly* standard rates.

(3) For the engineering trade a method is described for calculating the change in average earnings due to movement inside the trade the validity of which depends upon the assumption that the different wage censuses are based upon representative samples of the trade under consideration. In view of the warning of the Labour Department that for the building trade the results of the

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[23] The change in average earnings of bricklayers, &c., for a constant distribution of these grades of workers is the same as the change shown in Table IX, owing to the fact that in this case the earnings of the different workers are practically identical

[24] The actual numbers are: 1886, 262 employees; 1891, 1,042 employees; 1906, 7,012 employees.

three censuses cannot be compared, one is certainly not justified in making this assumption, and consequently in this case movement inside the trade cannot be dealt with.

2. *The engineering trade.*—The 1886 wage census gives details of full time earnings, &c., of about 54,000 employees, and the 1906 census gives similar details of about 113,000 employees. The Labour Department say nothing in this case of the two reports not being comparable.

The Board's wage index numbers for this trade, published in *Annual Abstract of Labour Statistics*, are based upon the unweighted mean of the standard time rates of wages in the chief industrial towns of the United Kingdom of the following grades—fitters, turners, ironfounders and patternmakers, and accordingly give a measure of the change in standard time rates of these grades for the United Kingdom as a whole. For comparison corresponding figures showing the change in average earnings for time and piecework for the same grades were obtained from the two wage censuses. Since a large number of these men are employed at piecework (for which higher wages are paid than for timework), and since there has been a movement during the period from time to piecework, average earnings have increased from this cause alone. To eliminate this the change in average earnings has been calculated for a constant distribution of workers. The change in average earnings for timework only has also been calculated from the two wage censuses. The results obtained are given in the following table:—

TABLE XI.—*Changes in standard rates of wages and in average earnings of fitters,* turners, ironfounders and patternmakers. ("Full time" for a selected week.)*

	1886.	1906.
United Kingdom—		
(*a*) Change in standard weekly time rates	89	100
(*b*) Change in average earnings (time and piecework†) for a constant distribution of workers	84	100
(*c*) Change in average earnings (time work only)	84·5	100
London—		
(*a*) Change in standard weekly time rates	97	100
(*b*) Change in average earnings (time and piecework†) for a constant distribution of workers	94	100
(*c*) Change in average earnings (time work only)	93	100

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* Erecters were grouped with fitters in the 1906 census, and have accordingly been included with them in 1886. Their number is very small compared with that of the fitters.

† Since there were no "bonus" workers in 1886 they have been omitted for 1906 also. They form less than 4 per cent. of all workers.

The standard rates for London were obtained from *Standard Time Rates of Wages in the United Kingdom*, the rates for the different grades being weighted according to the relative numbers employed, as shown for London in the wage census for 1906.

On examining the figures given in the above table we see that average earnings have increased faster than standard rates, both for London and the United Kingdom, even when the increase due to movement from "time" to "piecework" is deducted. This is very unexpected, although a possible explanation may lie in the fact that the membership of the various trade unions concerned has increased enormously during the period, so that year by year an increasing proportion of the workers receive the standard rate instead of a lower rate of wages, thus producing an increase in average earnings quite apart from any increase in standard rates. We also see that average earnings for "time" and "piece" work have increased at practically the same rate as average earnings for "time" work only.

The change in average earnings for the whole of the engineering trade, for a constant distribution of workers, was calculated from the two wage censuses. The figures obtained, both for London and for the United Kingdom, were very similar to those already obtained when fitters, &c., only were considered. It was difficult to determine the change in average earnings for a constant distribution of workers, because for this trade the classification of occupations was very different in the two censuses. This difficulty was overcome to a certain extent with the help of an engineer with a very large experience of the trade, who very kindly condensed the 1886 report to correspond with the report for 1906. The actual results obtained are as follows:—

TABLE XII.—*Change in average "full time" earnings for the whole of the engineering trade.* (*"Full time" for a selected week.*)

	1886.	1906.
United Kingdom—		
(*a*) Change in average earnings	79	100
(*b*) Change in average earnings for a constant distribution of workers (1906 distribution)	83	100
London—		
(*a*) Change in average earnings	86·5	100
(*b*) Change in average earnings for a constant distribution of workers (1906 distribution)	91	100

To obtain the change in average earnings due to a movement having taken place from poorer to better paid work inside the trade, as shown by the two wage censuses, the average earnings of all those working at the trade for the two years was determined, using the percentage of workers employed at the different occupations actually given in the two reports, but keeping the wage for any given occupation the same in the two cases. In these circumstances any change found in the two averages must be due to a movement having taken place from occupation to occupation inside the trade. In working out the results given in the following table the "full time" wages for 1906 were used:—

Table XIII.—*Change in average earnings in the engineering trade due to movement from occupation to occupation inside the trade. ("Full time" for a selected week.)*

	1886.	
United Kingdom	95	100
London	95·5	100

If we could assume that the wage censuses for the two years were based upon thoroughly representative samples of the engineering trade, we could use these results to correct for movement inside the trade index numbers originally calculated on the assumption that the distribution of workers had remained unchanged. Although the samples used for the engineering trade were undoubtedly more representative than those used for the building trade, one is probably not justified in regarding them as truly representative, so that the index numbers which have been calculated both for the building and engineering trades for the period 1900–12 have not been corrected for movement inside the trade, and are, therefore, to this extent incorrect.

The results of the comparison between the two wage censuses may be summarised as follows:—

(1) The change in average earnings of fitters, turners, ironfounders and patternmakers for timework is representative not only of changes in the earnings of all the workers in these grades, but also of changes in earnings of all the workers in the engineering trades. When calculating the change in wages in this trade from 1900 to 1912, therefore, the index numbers will be based upon changes in wages in these four grades.

(2) Actual earnings have increased at a somewhat faster rate than standard rates of wages, both for the United Kingdom and for London.

It is not possible to obtain information of the relation between changes in standard rates and actual earnings, &c., for any other trades. In all other cases, therefore, we shall have to rely upon the information as to changes in standard rates, &c., given in the various annual publications of the Board of Trade.

No conclusion has been reached as to the probable effect of a reduction in the hours of labour upon workers paid by the hour. It is generally stated that such a reduction has very little effect when the wages of all workers are considered. For the purpose of this paper it will be assumed that this is so, and no allowance will be made for any reduction in the hours of labour that may have taken place.

Change in average earnings due to movement from trade to trade.—No information can be obtained of any change in average earnings owing to a movement from trade to trade for the period under discussion, since the report of the population Census for 1911 containing details of occupations is not yet published. If, however, we take the relative numbers employed at the nine trades used in the present paper, as given in the population Censuses for 1891 and 1901 respectively, and treat movement from trade to trade in the manner already described for movement from occupation to occupation inside a trade (*i.e.*, the engineering trade), we find that during this period practically no change took place in the average wage of these workers due to this cause. We shall, therefore, assume that the same is true for the period 1900 to 1912. The details upon which this calculation is based are given in the following table :—

TABLE XIV.—*Change in average wage in the Administrative County of London due to movement from trade to trade*, 1891-1901.

Occupation.	Number employed, 1891.	Number employed, 1901.	Average wage for London, 1906.
			s.
Building trade	115,600	149,960	36·25*
Engineering trade	20,690	53,710	36·75*
Carters and carriers	43,680	60,510	26·00†
Railwaymen	18,530	28,870	25·96‡
Tailors	24,470	31,390	34·83§
Cabinet makers, French polishers and upholsterers	27,810	28,140	35·50*
Boot and shoe makers	31,460	24,590	28·25*
Dock and wharf labourers	14,560	19,710	27·08‖
Compositors	16,850	17,480	39·00†
Average wage of all workers	33·0*s.*	33·1*s.*	

* Average earnings of "all workers" in London (1906 wage census).

† See p. 51.

‡ Average wage of "all workers" in England and Wales.

§ Average earnings of "all workers" in the United Kingdom (1906 wage census).

‖ 50 hours per week at 6½*d.* per hour.

(*b*) *Changes in the wages of male manual workers in London*, 1900–12.—Any change in wages reported to the Labour Department of the Board of Trade is published yearly in *Changes in Wages and in the Hours of Labour in the United Kingdom*. In Tables A and B (see Appendix) will be found for certain trades all the changes that have taken place in London during the period under discussion, together with the number of workers stated to have been affected by the change: and where possible for comparison the corresponding change in standard rates of wages, which have been taken partly from *Standard Time Rates of Wages in the United Kingdom* and partly from *Annual Abstract of Labour Statistics*. There is also given in each case the number of workers who should have received the increased wage had it been universal. In many cases the standard rate has been increased by the whole amount of the change, although only a proportion of the workers received the new rate. The Board base their wage index numbers upon changes in standard rates, and in view of this fact it seems possible that they may show too large an increase from year to year.

Since changes in wages tend to concentrate to a large extent in definite years, unless care is taken to include these years in any period that may be selected very misleading results may be obtained. In the present case, important changes took place in 1900, 1911 and 1912, so that the period under discussion includes the latter changes. Index numbers for 1899 have, however, been prepared to indicate the change that took place between 1899 and 1900.

Information of changes in wages sufficiently reliable and detailed to allow of the calculation of a wage index number is only available for nine groups of workers. Strictly speaking, therefore, the final wage index numbers obtained only apply to these particular workers. In the case of the Administrative County of London the information with regard to occupations given in the population Census for 1901 is sufficiently detailed to enable us to calculate what proportion of all the manual workers in the area are employed in the nine selected trades. There are, speaking very roughly, about 921,000 employed male manual workers in the county of London,[25] and of these about 450,000 are engaged in the nine trades in question, that is to say, the wage index numbers obtained apply directly to about one-half of all the manual workers in London.

Two series of index numbers have been calculated, based upon the data given in Tables A and B.

Series A.—Based on the assumption that all the workers eligible received any increase in standard rates that may have taken place in the course of a few years after the change; that is to say, the index numbers are based upon changes in standard rates. These index numbers will, on the whole, show too large a change from year to year. As there are no generally recognised standard rates in certain of the selected trades, index numbers for this series could not be calculated in these cases.

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[25] This is only a very rough approximation. In many cases it is not possible to say with any certainty whether persons included under certain headings are manual workers or not.

Series B.—Based upon the assumption that any increase in wages was only received by the number of workers stated by the Board to have been affected by the change. These index numbers are obtained by comparing year by year the total wage bills for London for the different industries. The increase in the total wage bill from year to year is obtained by multiplying any increase in wages that may have taken place by the number of workers stated to have been affected by the change. These index numbers will, on the whole, show too small an increase.

To obtain the total wage bill for any occupation or trade it is necessary to know not only the average wage for the trade but also the approximate number of workers. In some cases the former can be obtained from the 1906 wage census, which gives not only the average wage of those working full time, but also of all workers whether working full time or more or less than full time. As we wish to deal with the whole trade it is the latter figure which will be used. For trades not dealt with in the wage census, details of the average wage have been obtained from various sources, which will be referred to in the short notes about the individual trades after Table XV.

The changes in wages stated by the Board as having taken place in "London," include changes that have taken place not only in the Administrative County but also in the area known as "Extra London," which areas together make up "Greater London." It is, however, not easy to obtain the approximate number of workers in the different trades since "Greater London" is not treated as a single area in the census. Full details of the number of persons engaged in the different occupations living in the Administrative County, and almost as full details for the county of Middlesex (the whole of which is included in Greater London), can be obtained from the population Census for 1901, but it is only possible to obtain very scanty data for the metropolitan areas of Essex, Surrey, Kent and Herts, which are included in the returns for their respective counties. For these areas it is possible to obtain the number of persons living in the urban and rural districts, but details of occupations could only be obtained for persons living in urban districts of more than 5,000 inhabitants. Fortunately the number of persons in Greater London living in rural districts is relatively very small. Even for the urban districts, however, we do not know the number of persons following any particular occupation, as the returns are only classified under main headings; we know, for example, the number engaged in the "Conveyance of men, goods and messages," but we do not know what proportion of these are "carters or carriers" or "railwaymen." In these circumstances it is assumed that in every case the proportion for the metropolitan area is the same as for the county as a whole, for which detailed information is available. Any error this assumption may introduce will not have any marked effect upon the final figures since a large proportion of the workers in Greater London live either in the Administrative County or in Middlesex.

For our present purpose we are only concerned with the number of male adult employees in any given trade or occupation: we do not wish to include: (1) employers and men who are working on their own account; or (2) workers under 20 years of age, who are mostly apprentices or learners, since these classes of workers are not eligible for any increase in wages that may take place. For the Administrative County of London the number of adult employees in the different trades can be obtained from the population Census for 1901. For the other metropolitan areas, however, this information is not available. For these areas the required figures were obtained by making the following assumptions:—(1) That for trades dealt with in the 1906 wage census the proportion of adult workers is the same as that given for London in the Census report. (2) That for trades not dealt with in the wage census the proportion is the same as for the Administrative County. (3) That for all trades the proportion of the adults who were employed persons is the same as for the Administrative County. An example will perhaps make this clearer:—

Number of employed persons in the building trade in Greater London in 1901.

Number of workers in the Administrative County of London	149,960
Number of adult workers in the Administrative County of London	136,700
Number of employed adults in the Administrative County of London	123,970
Proportion of all adults in the building trade who were employees in the Administrative County of London	90·7 per cent.
Number of workers in Extra London	87,220
Proportion of all workers who are adults (1906 wage census)	94 per cent.
Therefore—	
Number of adults in Extra London	81,950
Number of employed adults in Extra London	74,320
Number of employed adults in Greater London	198,290

Having obtained the number of adult workers in any given trade, it now remains to discover how many of these workers are engaged at a particular occupation. Although we have to use the population Census for determining the number of persons engaged at a given trade, it was found to be so inaccurate in assigning these workers to their respective occupations, that for this purpose the 1906 wage census was used instead. According to the population Census, for example, 20 per cent. of all workers in the engineering trade are either blacksmiths or blacksmith's strikers, while according to the wage census the proportion is only 6·6 per cent. I have consulted several engineers, who all say that 20 per cent. is an impossible figure and that they would estimate the proportion to be about 6 per cent. To find, therefore, the number of workers engaged in any particular occupation, *i.e.*, the number of bricklayers in the building trade, it was assumed that the proportion was the same as that found for London from the wage census for 1906.

The index numbers obtained are given in Table XV (see Appendix), and the details of the source of the data, method employed in working out the figures, &c., are given for each trade after the table. In all cases the index numbers are based upon the changes in wages given in Tables A and B.

General index numbers for Series A and B respectively have been prepared, and taking the mean of these two series as the final figures, we see that between 1900 and 1910 wages remained almost stationary, although during the same period the cost of living increased by 5 per cent. Wages certainly advanced during 1911 and 1912, but not sufficiently to compensate for the increase in prices, for, taking the whole period 1900 to 1912, while the cost of living increased by 7 per cent., wages only increased by a little over half that amount.

The index numbers given in the last line of Table XV make no allowance for any change that may have taken place in the number of workers who were unable to find employment from year to year, and it now remains for us to make the necessary alterations. Index numbers showing the level of employment from year to year for five of the nine trades used in calculating the wage index numbers have been taken from a recent paper by Dr. Bowley, and a general index number has been calculated by weighting the different index numbers according to the number of workers engaged in the particular trades in Greater London (see Table XVI in Appendix). It should be noted that Dr. Bowley's index numbers apply to the whole of the United Kingdom and not only to London.

The wage index numbers given in Table XV represent the relative wage received year by year by the workers, and the index numbers for employment the change in the relative number of workers who received these wages, so that by multiplying together the corresponding figures for the different years we shall obtain a series of figures representing the change in the wages of manual workers, allowing each year for the number of workers who received no wage at all on account of unemployment. The results of these calculations are given in the last column of Table XVI.

III. *Changes in "real wages."*

The "cost of living" index numbers given in Table VIII represent the change that has taken place in the purchasing power of money during the period under consideration, and the wage index numbers given in the last column of Table XVI, the change in the amount of money received by the workers. To obtain, therefore, figures to show the change in "real wages," the wage index number for each year must be multiplied by the reciprocal of the corresponding index number of the "cost of living." In this way the following figures were obtained :—

TABLE XVII.—LONDON. *Index numbers showing the change in real wages*, 1900-12. (*Average* 1900-11 = 100.)

Year.	"Real wages."	Year.	"Real wages."	Year.	"Real wages."
1900	106·4	1905........	98·4	1909........	92·8
'01	106·4	'06........	100·4	'10........	96·2
'02	104·2	'07........	100·4	'11........	100·4
'03	102·5	'08........	93·2	'12........	100·4
'04	99·3				

The figures given in the table show that over the whole period there has been a marked diminution in "real wages," for although from 1909 to 1912 they increased by about 8 per cent., the decrease from 1900 to 1909 amounted to about 13 per cent.

Consumption per head.

An index number showing the change in "consumption per head" of the various articles of food by the working classes should give a very good measure of the change in working-class prosperity, since "consumption per head" is affected not only by the condition of retail prices, but also by the amount of average weekly wages.

The Board of Trade, in their *Annual Abstract of Labour Statistics*, give for each year the "consumption per head" of certain of the principal articles of food by the population of the United Kingdom as a whole. These figures are given in the form of index numbers in Table XVIII (see Appendix). The original figures were obtained by dividing the total amount of the various commodities consumed in this country by the population. The index numbers, therefore, appear to give the change in "consumption per head" of the whole population, whereas, since the consumption of the more important articles of food is practically constant in the case of persons with incomes over a certain limit, there is actually in this table, spread over the whole population, a change which is almost entirely confined to the working classes. Although these figures, therefore, inevitably show the direction of any change that has taken place, the actual change in consumption of the staple articles of food by the working classes is always greater than is indicated.

The two series of general index numbers of consumption per head given in Table XVIII were obtained by using two systems of weights—the first based upon the relative amounts spent on the different commodities by the whole population, and the second upon the relative amounts spent by the working classes, *i.e.*, the same system of weighting as that used for the calculation of the general index numbers of retail prices. The two series of figures do not differ from one another very markedly. The differences that do occur are mainly due to the fact that, in the first system of weighting, meat is given a larger weight and flour a smaller weight than in the second case. Since the figures for consumption per head are concerned with the whole population, the first system of weighting seems to be the more appropriate, and accordingly the first series of general index numbers given in the table will be used for comparison with those for "real wages." On the whole these figures show that since 1900 there has been a decrease in the amount of certain of the principal articles of food consumed per head of the population, and this fact is in agreement with the result already obtained with regard to the change in "real wages."

Beer and tobacco were not included in calculating the general figures, since in the former case the decrease in consumption may well be due to a spread of temperance principles, while in the latter case the wealthier classes may be largely responsible for the increase in consumption that has taken place.

Commodities such as wool and cotton were also not used for the purpose of this calculation, since only a very small proportion of the working man's wages are spent on them. Moreover, the change in "home consumption" in this case is probably largely due to the change in the spending power of the wealthier classes, for although the amount consumed never drops below a certain limit, it undoubtedly increases with increasing wealth.

The "consumption per head" figures refer to the whole of the United Kingdom, and so, strictly speaking, should not be compared with figures for "real wages" for London only. Unfortunately this is inevitable, as it is impossible to obtain figures for "consumption per head" for London only.

Conclusions.

The results obtained under the various sections have been summarised in the following table, which gives—(1) the change in retail food prices; (2) the change in the cost of living; (3) the change in wages; (4) the change in "real wages," and, finally, the change in "consumption per head" of certain of the principal articles of food.

TABLE XIX.—*Table of final index numbers*, 1900-12.

(*Average* 1900-12 = 100.)

Year.	Retail food prices (London).	Cost of living (London).	Wages* (London).	"Real wages" (London).	Consumption per head (United Kingdom).
1900	97·2	97·5	103·7	106·4	102·0
'01	97·1	97·8	104·1	106·4	101·7
'02	98·1	98·4	102·5	104·2	100·9
'03	98·1	98·6	101·1	102·5	98·5
'04	99·1	99·2	98·5	99·3	100·0
'05	100·2	100·0	98·4	98·4	99·0
'06	99·6	99·7	100·1	100·4	100·8
'07	99·3	99·5	99·9	100·4	100·5
'08	101·6	101·5	94·6	93·2	98·3
'09	102·5	102·1	94·7	92·8	100·3
'10	103·1	102·5	98·6	96·2	98·2
'11	103·8	103·1	103·5	100·4	99·6
'12	105·4	104·3	104·7	100·4	100·8

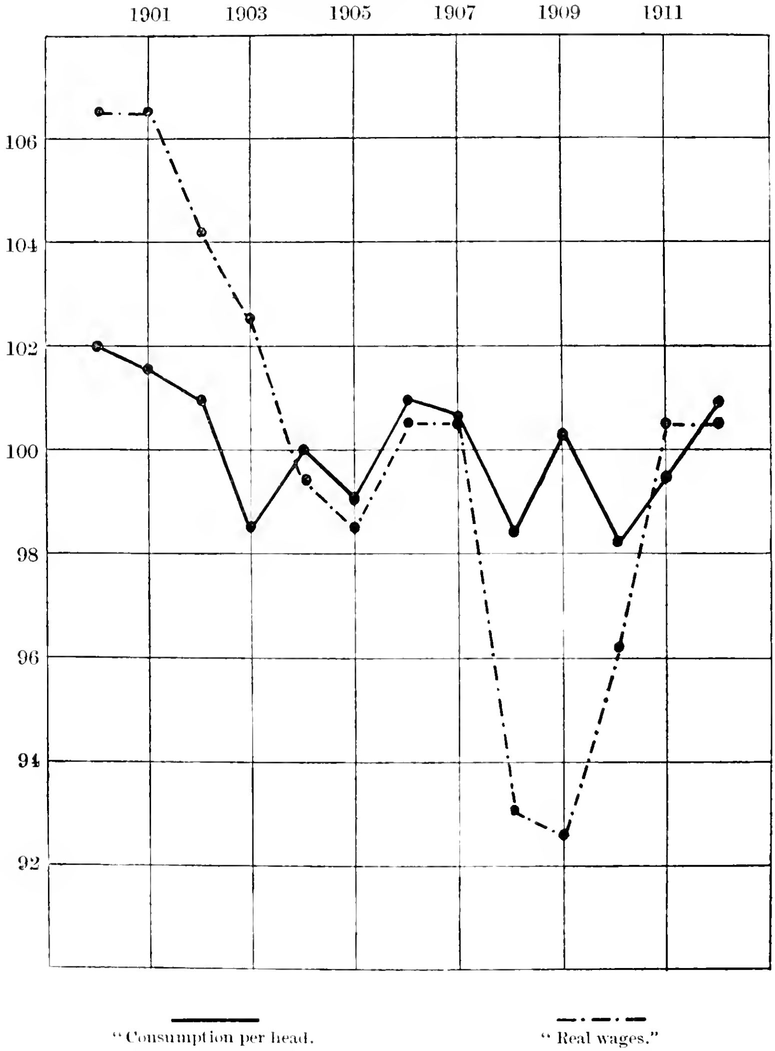
* Including change in the amount of employment.

According to the present investigation between 1900 and 1912 retail prices in London increased by about 8 per cent. The Board of Trade, on the other hand, estimate the increase at about 15 per cent. The index numbers by Dr. Bowley for the years 1900–10 agree with the figures obtained as a result of the present investigation. Both these series of figures show a distinctly smaller increase in prices than the Board's figures for the same period.

During this period wages have not kept pace with prices, even when the increase which took place in 1912 is included. While the

DIAGRAM 5.—*Index numbers of "real wages" of the working classes in London and of "consumption per head" for the whole of the United Kingdom*, 1900-12.

(*Average*, 1900-11 = 100.)



cost of living increased by 7 per cent., wages, when changes in the amount of employment are taken into consideration, only increased by about 1 per cent. In other words, taking the period as a whole, "real wages" in London show a marked decrease. Between 1900 and 1909 they dropped by about 13 per cent., and between 1909 and 1912 rose by about 8 per cent. with the net result that for the whole period they actually dropped by about 6 per cent.

The index numbers for "consumption per head" confirm these results. The two series of figures are plotted on Diagram 5, and we see that, with the exception of the years 1903 and 1909, the two series agree in the direction of the change from year to year, although in all cases the "consumption per head" figures show much smaller fluctuations. It will be remembered that earlier in this paper it was pointed out that "consumption per head" figures only show the direction and not the full extent of the change in the spending power of the working classes.

The purpose of this inquiry was to discover to what extent the prosperity of the working classes in London had changed during recent years. The results obtained show that there has been a substantial increase in the cost of living, which has not been accompanied by a correspondingly large increase in wages. If the Board's figures for the change in retail prices are taken in preference to those obtained during the present investigation, the discrepancy between increase in the cost of living and the increase in wages is still more marked..

Before concluding this paper I wish to express my thanks to the numerous firms and private individuals who have kindly supplied me with information, and especially to Dr. M. Greenwood for the very valuable advice he has given me during its preparation.

APPENDIX.

TABLE I.—LONDON. *Index numbers showing the change in the retail price of various articles of food for individual firms*, 1900-1912. (1911 = 100.)

Commodity.	Firm.	Data upon which the index numbers are based.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.
Meat—English beef	Group I—Firm A	Average price per lb. of following: rump, loins, fore ribs, top ribs, top sides	—	—	102*[a]	94*	94*	95*	92·5*	92·5*	92·5*	92·5*	96*	100*	102*
	Firm B	Average price per lb. of all joints quoted in yearly catalogues or weekly price lists[b]	—	—	—	—	—	—	99	99	98·5	98·5	100	100	100
	Group II—Firm D		87	89	—	94	94	94	95	—	96	97*	97*	100*	101*
	Firm E		90	—	91	98	—	—	—	—	—	—	—	100*	103*
	Firm F		87	—	91	91	—	93	—	—	—	—	—	100*	104*
	Firm Z	Average price per lb. of following: ribs for rolling, silverside, beef steak, rump steak, thick flank, thin flank, shin with bone	—	104	111	97	97	97	97	96	99	99	109	100	108*
Foreign beef	Group I—Firm A	The same as in the case of English beef	—	—	112*	105*	102*	98*	100*	107*	107*	105*	105*	100*	104*
	Group II—Firm E		98	—	102	108	—	—	—	—	—	—	—	100*	101*
	Firm F		—	—	94	94	—	92	—	—	—	—	—	100*	97*[c]
	Firm Z		—	112	126	109	106·5	106·5	106·5	109	95	101	102	100	109
English mutton	Group I—Firm A	Average price per lb. of following: leg, loin, shoulder	—	—	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*	97*
	Firm B	Average price per lb. of all joints quoted in yearly catalogues or weekly price lists	—	—	—	—	—	—	102	102	101	99	100	100	102
	Group II—Firm D		98	100	—	102	102	102	102	—	102	101*	100*	100*	105*
	Firm E		95	—	96	99·5	—	—	—	—	—	—	—	100*	103*
	Firm F		97	—	99	99	—	99	—	—	—	—	—	100*	103*
	Firm Z	Average price per lb. of following: leg, shoulder, best end of neck, scrag end of neck, chops, breast	—	103	106	102·5	105	105	104	104	101	100	102	100	106*
Foreign mutton	Group I—Firm A	The same as in the case of English mutton	—	—	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*
	Firm B		—	—	—	—	—	—	95	95	99	100	100	100	101
	Group II—Firm D		82	93	—	96	97	97	97	—	91	94*	100*	100*	100*
	Firm E		87	—	91	91	—	—	—	—	—	—	—	100*	100*
	Firm F		—	—	94	94	—	96	—	—	—	—	—	100*	101*
	Firm Z		—	93	95	100	102	100	93	100	102	93	102	100	101*

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[a] Index numbers marked with an asterisk are based upon an average price for the year.

[b] Keeping the joints the same throughout the period.

[c] In September of 1911 the quality of the foreign beef sold by this firm was changed; a poorer quality than that sold in the earlier years of the period being substituted. A similar change took place in the case of the other firms about the middle of the period.

TABLE I.—LONDON. *Contd.—Index numbers showing the change in the retail price of various articles of food.*

Commodity.	Firm.	Data upon which the index numbers are based.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.
Pork	Group I—Firm A	Average price per lb. of following: loin, leg, shoulder	—	—	96*	96*	96*	96*	98*	98*	98*	102*	106*	100*	106*
	Firm B	Average price per lb. of all joints quoted in yearly catalogues or weekly price lists	—	—	—	—	—	—	100	100	93	97	100	100	100
	Group II—Firm E		99	—	101	107	—	—	—	—	—	—	—	100*	101*
	Firm Z	Average price per lb. of following: leg, fore loin, belly, chops	—	96	100	95	93·5	92	97	93·5	95	96	101	100	97*
Bacon	Group I—Firm A	Average price per lb. of following: collar, back, streaky	—	85*	85*	75*	71*	88*	85*	80*	88*	100*	105*	100*	102*
	Firm B	Average price per lb. of all cuts quoted in yearly catalogues	—	—	—	—	—		89	92	90	100	105	100	102
	Firm C	Average price per lb. of following: collar, back, streaky	87·5*	90*	87·5*	87·5*	83*	85*	90*	85*	83*	86*	99*	100*	93·5*
	Group II—Firm D	Average price per lb. of all cuts quoted in yearly catalogues or weekly price lists		—				93	99		98	101*	97*	100*	108*
	Firm F		—		83	82		82	82	83	85·5	88	107	100*	103*
	Firm Z	Average price per lb. of following: collar, back, streaky		97	97	97	97	97	95	88	100	102	122	100	103*
Butter	Group I—Firm A	Average price per lb. of all qualities sold	89*	89*	86*	86*	79*	86*	89*	82*	89*	86*	93*	100*	96*
	Firm B				—				95	90	86	86	86	100	99
	Firm C		100*	100*	100*	96*	96*	100*	100*	100*	100*	100*	100*	100*	100*
	Group II—Firm D	Average price per lb. of following: Danish and "selected"		—	—	—	—	91	91		91	—	91*	100*	102*
	Firm Z			88	86	80	89	89	95·5	86	89	89	89	100	100
Canadian cheese	Group I—Firm A	Price per lb. of Canadian cheese	75*	75*	75*	81*	69*	87·5*	87·5*	91*	91*	87·5*	87·5*	100*	100*
	Firm B		—	—	—	—		—	91	88	88	88	88	100	100
	Group II—Firm D		93·5	93·5	—	93·5	87·5	93·5	93·5		93·5	100*	99·5*	100*	107*
	Firm E		91	91	86	91	80	91	91	97	97	97	97	100*	102*
	Firm F		88		88	91	—	82	88	100	100	100	100	100*	101*
	Firm Z		—	82	82	82	76·5	88	91	91	91	91	88	100	109*

TABLE 1.—LONDON. *Contd.—Index numbers showing the change in the retail price of various articles of food.*

Commodity.	Firm.	Data upon which the index-numbers are based.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.
Sugar	Group I[d] Firm A	Average price per lb. of following: loaf, granulated, Demerara	68*	71*	73·5*	73·5*	76·5*	85*	73·5*	76·5*	68*	73·5*	76·5*	100*	82*
	Firm B	Average price per lb. of all qualities quoted in yearly catalogues	—	—	—	—	—	—	81	83	78	78	78	100	81
	Firm C	Average price per lb. of following: loaf, white granulated, Demerara, and yellow crystals	61*	61*	75*	68*	68*	101·5*	77*	75*	75*	68	75*	100*	80*
	Group II Firm D[e]	Average price per lb. of following: loaf, granulated, Demerara	93	100	—	89	96	111	100	—	100	96	—	100	119*
	Firm E	Average price per lb. of all qualities quoted in yearly catalogues or weekly price lists	75·5	—	80	76	88	88	88	88	84	85	93	100*	97*
	Firm F		—	—	84·5	89	—	120	96	96	97	90	103	100*	111·5*
	Firm Z	Average price per lb. of following: loaf, white granulated, Demerara	—	73	62	70	78	76	76	78	68	68	86·5	100	85·1
Rice	Group I Firm B	Average price per lb. of all qualities quoted in yearly catalogues	—	—	—	—	—	—	100	100	100	100	100	100	100
	Group II Firm D	Price per lb. of Rangoon rice	100	100	—	100	100	100	100	—	100	100	—	100	100*
	Firm E	Average price per lb. of all qualities quoted in yearly catalogues or weekly price lists	98	98	98	98	—	98	98	98	100	100	100	100*	104*
Tea	Group I Firm A	Average price per lb. of all qualities sold	113*	113*	113*	107*	120*	100*	100*	100*	100*	100*	93*	100*	100*
	Firm B		—	—	—	—	—	—	100	100	100	100	100	100	100
	Group II Firm D	Average price per lb. of the two cheapest qualities sold	97	97	97	97	116	100	100	100	100	100*	100*	100*	100*
	Firm Z		—	100	100	100	110	105	98	100	100	100	100	100	100*
Bread	Group I Firm B	Price of a 4-lb. loaf	100*	100*	100*	100*	101*	103	100*	97*	109*	112·5*	104*	100*	101*
	Firm G		95·5*	94*	97*	100*	102*	100*	97*	99*	108*	111*	106*	100*	108*
	Firm H		—	—	—	—	—	—	100*	100*	109*	118*	109*	100*	109*
	Firm M		—	—	—	—	—	94*	94*	93·5*	103*	107*	101*	100*	103*
	Group II Firm D		96*	96*	96*	96*	96*	96*	96*	104*	113*	113*	104*	100*	113*
	Firm E		100	—	92	100	100	100	96	92	100	100	117	100*	106*
	Firm F		100	—	92	92	—	100	100	92	100	100	108	100*	100*
	Firm K		96*	96*	96*	96*	104*	96*	87*	96*	104*	117*	108*	100*	100*
	Firm L		94*	91*	94*	98*	103*	103*	100*	103*	104*	109*	104*	100*	100*

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[d] The variation shown between the different index numbers for sugar for 1912 is striking. It is interesting to note that three of the firms showing a big decrease since 1911 are working-class firms.

[e] The index number for sugar for 1911 for this firm was based upon the yearly catalogue price and not upon the average price of the year. The yearly catalogue was issued before the big increase in the price of sugar which took place during the autumn of 1911.

TABLE I.—LONDON. *Contd.—Index numbers showing the change in the retail price of various articles of food.*

Commodity.	Firm.	Data upon which the index numbers are based.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.
Flour …………	Group I—Firm B	Average price per 7 lbs of following: "best households," "selected self-raising"	—	—	—	—	—	—	102	117	117	107·5	100	100	105
	Group II—Firm D	Average price per 7 lbs. of following: "households" "pastry whites" …………	95·5	101·5	—	100	100	109	100	—	104·5	109	—	100	106*
	Firm E	Average price per 7 lbs. of following: "households," "whites" …………	96	—	101	99	101	104	94	92	103	103	112·5	100*	106·5*
	Firm F	Average price per 7 lbs. of following: "households," "whites" …………	95·5	—	95·5	95·5	—	104·5	100	91	109	104·5	109	100*	102*
	Firm Z …………	Average price per 7 lbs. of following: "American finest" …………	—	87·5	87·5	87·5	—	104	96	109	101	112·5	100	100	103*
Milk …………	All Firms …………	Price of a quart …………	94	94	94	94	94	94	94	94	94	94	94	100	98
Soap[f] …………	Group I—Firm B	Average price per 3-lb. bar of following: "Primrose," "mottled" …………	—	—	—	—	—	—	86	100	86	86	100	100	100
	Group II—Firm D	Average price per 3-lb. bar of following: "yellow," "mottled" …………	80	80	—	86	80	86	94	—	91	91*	98*	100*	100*
	Firm E	Average price per 3-lb. bar of following: "Primrose," "mottled," "scrubbing" …	91	—	91	92	97	97	97	109	109	95	99	100*	100*
	Firm F	Average price per 3-lb. bar of following: "Primrose," "scouring" …………	78	—	92	92	—	78	78	89	91	92	97	100*	100*
	Firm Z …………	Average price per 3-lb. bar of following: "yellow," "scrubbing" …………	—	87·5	94	91	81	—	94	106	100	94	106	100	106
Coal[f] …………	Firm Z …………	Price per ton of "bright nuts"	—	99	97	97	92	92	90	108	96	96	93	100	111
Cotton by the yard[f]	Firm D …………	—	88	88	—	88	93	93	96	—	99	100	—	100	—

[f] Not included in the general index number.

TABLE IIA.—LONDON. *Average index numbers showing the change in the retail price of various articles of food for working-class and middle-class firms*, 1900-12. (1911 = 100.)

Year.	English beef (21).*			Foreign beef (21).			English mutton (12).		
	Working class firms.	Middle class firms.	Board of Trade.†	Working class firms.	Middle class firms.	Board of Trade.	Working class firms.	Middle class firms.	Board of Trade.
1900....	—	88	96	—	98	86·5	—	97	106
'01....	—	89	96	—	—	88	—	100	106
'02....	102	91	101	112	98	94	100	97·5	106
'03....	94	94	98·5	105	101	92	100	100	106
'04....	94	94	96	102	—	88	100	102	105
'05....	95	93·5	94	98	92	85	100	100·5	106
'06....	96	95	94	100	—	85	101	102	106
'07....	96	—	95	107	—	89	101	—	106
'08....	95·5	96	99	107	—	96	100·5	102	105
'09....	95·5	97	98	105	—	97	99·5	101	101
'10....	98	97	103	105	—	101	100	100	102
'11....	100	100	100	100	100	100	100	100	100
'12....	101	104	105	104	100·5	110	99·5	104	106

	Foreign mutton (12).			Pork (15).			Bacon (19).		
1900....	—	84·5	95	—	99	98	87·5	—	79
'01....	—	93	98·5	—	—	101·5	87·5	—	90
'02....	100	92·5	98	96	101	103	86	83	89
'03....	100	94	104	96	107	99	81	82	84
'04....	100	97	101	96	—	96	77	—	78
'05....	100	96·5	100	96	—	96	86·5	87·5	86
'06....	97·5	97	98	99	—	99·5	88	90·5	94
'07....	97·5	—	101	99	—	98	86	83	93
'08....	99·5	94	102	95·5	—	95	87	92	88
'09....	100	94	98·5	99·5	—	98	95	94·5	98
'10....	100	100	101	103	—	103	103	102	107·5
'11....	100	100	100	100	100	100	100	100	100
'12....	100·5	100	101	103	104	101	99	105·5	105

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* The figures in brackets are the weights assigned to the various commodities.

† The Board's revised index numbers obtained from *Report of the Cost of Living Enquiry for* 1912. [Cd.–6955.]

TABLE IIA *Contd.—Index numbers showing change in the retail price.*

Year.	Butter (41).			Canadian cheese (10).			Sugar (19).		
	Working class firms.	Middle class firms.	Board of Trade.	Working class firms.	Middle class firms.	Board of Trade.	Working class firms.	Middle class firms.	Board of Trade.
1900....	94·5	—	92	75	91	93·5	66	84	80
'01....	94·5	—	93·5	75	92	86	67·5	100	87
'02....	93	—	92	75	87	87	74	82	80
'03....	91	—	89	81	93	92·5	71	85	85
'04....	87·5	—	88	69	84	87	72	92	90
'05....	93	94	91	87·5	89	87	95	106	107
'06....	95	94	94	91	92	93·5	77	95	90
'07....	91	—	93	91	98·5	98	78	92	96
'08....	92	94	97	91	97	95	74	94	94
'09....	91	—	94·5	88	99	96	73	90	89
'10....	93	94	97	88	99	95	76·5	98	102
'11....	100	100	100	100	100	100	100	100	100
'12....	98	102	104·5	100	104	109	82	109	110

	Rice (3).			Tea (22).			Bread (50).		
1900....	—	99	100	113	97	97	98	97	88
'01....	—	99	100	113	97	100	97	94	82·5
'02....	—	98	97	113	97	100	98·5	94	88·5
'03....	—	99	98	107	97	100	100	96	95
'04....	—	100	93	120	116	106	101·5	101	95
'05....	—	99	93	100	100	105	99	99	96
'06....	100	99	94·5	100	100	97·5	98	96	90
'07....	100	98	109	100	100	100	97	97	94
'08....	100	100	108	100	100	100	107	104	101
'09....	100	100	96	100	100	100	112	108	109
'10....	100	100	93	96·5	100	100	105	108	105
'11....	100	100	100	100	100	100	100	100	100
'12....	100	102	111	100	100	100	106	104	105

Year.	Flour (20).			Milk (25).	
	Working class firms.	Middle class firms.	Board of Trade.	All firms.	Board of Trade.
1900	—	96	89	94	97
'01	—	104·5	88	94	97
'02	—	98	89	94	97
'03	—	98	91	94	97
'04	—	100·5	96	94	97
'05	—	106	97	94	97
'06	102	98	96	94	97
'07	117	91·5	101	94	97
'08	117	105·5	107	94	97
'09	107·5	105·5	113	94	97
'10	100	111	103·5	94	97
'11	100	100	100	100	100
'12	105	105	106	98	99

Table IIb.—London. *Index numbers showing the change in price of various articles of food*, 1900-12. (*Average* 1900-11 = 100.)

Year.	English beef.*			Foreign beef.		English mutton.*		
	Average index numbers for all firms.	Board of Trade retail figures.†	Board of Trade wholesale figures.‡	Average index numbers for all firms.	Board of Trade retail figures.	Average index numbers for all firms.	Board of Trade retail figures.	Board of Trade wholesale figures.
1900	96	98·5	102	96	94	97	101·5	103
'01	94	98	96	—	96	100	101	97
'02	100	104	103	101	102	98	102	98
'03	99	101	98	100	100	100	101	100
'04	99	98	96	100	96	101	100	101
'05	99	96·5	96	93	92·5	100	102	101
'06	101	96	96	98	93	101	101	105·5
'07	101	98	98	105	96·5	101	101	105·5
'08	101	102	100	105	105	101	101	101
'09	101	100·5	103	103	105	100	96	91
'10	103	105·5	107	103	110·5	100	98	100
'11	105	102	102	98	109	100	95·5	97
'12	109	107	—	100	119	102	102	—

Year.	Foreign mutton.		Pork.		Bacon.		
	Average index numbers for all firms.	Board of Trade retail figures.	Average index-numbers for all firms.	Board of Trade retail figures.	Average index numbers for all firms.	Board of Trade retail figures.	Board of Trade wholesale figures.
1900	88	95	100	99	98·5	88	79
'01	97	99	—	103	98·5	99	89
'02	99	98	100	104	95	98	100
'03	99	104	103	100	92	93	100
'04	103	101	97	97	87	86	89
'05	102	101	97	97·5	98	95	88
'06	98	98	100	101	100	104	100
'07	102	102	100	99	96	103	104
'08	102	102	97	96	100	97	96
'09	102	99	101	99	107	108	113
'10	104	102	104	104	115·5	119	131
'11	104	100	101	101	112·5	110	112
'12	104	101	104	102	114	116	—

* For beef and mutton the Board only give wholesale index numbers for English and foreign meat combined. These figures are given in this table under English meat.

† Revised index numbers taken from *Report of the Cost of Living Enquiry for* 1912. [Cd.–6955.]

‡ Taken from *Fifteenth Annual Abstract of Labour Statistics.*

TABLE IIB *Contd.—Index numbers showing the change in price.*

Year.	Butter.		Canadian cheese.		Sugar.			Rice.	
	Average index numbers for all firms.	Board of Trade retail figures.	Average index numbers for all firms.	Board of Trade retail figures.	Average index numbers for all firms.	Board of Trade retail figures.	Board of Trade whole-sale figures.	Average index numbers for all firms.	Board of Trade retail figures.
1900....	102	98	96	101	89	87	100	100	102
'01....	102	100	96	92·5	93	95	95	100	102
'02....	100	98	92	94	93	87	82	99	98
'03....	98	95	99	100	93·5	93	83·5	100	99
'04....	94	94	87	94	97	98·5	95	101	94
'05....	100	97	98	94	120	117	115·5	100	94
'06....	102	101	101	101	101·5	98·5	90	100	96
'07....	98	99	105	106	99	104	93	100	111
'08....	99	104·5	105	103	99	103	101	101	109·5
'09....	98	101	105	103·5	97	97	104	101	97·5
'10....	100	104	104·5	103	101	111	121	101	95
'11....	108	107	110	108	118	109	119	101	102
'12....	107	112	113	118	113	120	—	102	113

Year.	Tea.			Bread.				
	Average index numbers for all firms.	Board of Trade retail figures.	Board of Trade whole-sale figures.	Average index numbers for working-class firms.	Average index numbers for middle-class firms.	Average index numbers for all firms.	Board of Trade retail figures.	Board of Trade whole-sale figures* for wheat.
1900............	102	96	108	97	98	97	92	91
'01............	102	99·5	97	96	95	95	87	89
'02............	102	99·5	91	98	95	95	93	91
'03............	99	99·5	98	99	97	97	100	91
'04............	115	106	92	100	101	101	100	94
'05............	97	104	92	98	99	99	100	97
'06............	97	97	94	97	97	97	94	94
'07............	97	99·5	92	96	98	97	98	103
'08............	97	99·5	90	106	105	105	106	111
'09............	97	99·5	93	111	109	109·5	114	123·5
'10............	95	99·5	93·5	104	109	107	110	111
'11............	97	99·5	114	99	100	100	105	106
'12............	97	99·5	—	105	104	105	110	—

* Made up of foreign wheat with a weight of 4 and English wheat with a weight of 1.

TABLE IIB *Contd.—Index numbers showing the change in price.*

Year.	Flour.			Milk.		
	Average index numbers for middle-class firms.	Average index numbers for all firms.	Board of Trade retail figures.	Index numbers for all firms.	Board of Trade retail figures.	Board of Trade wholesale figures.
1900	94·5	94	91	99	100	96
'01	103	102	90·5	99	100	103
'02	97	96	91	99	100	105
'03	97	96	93·5	99	100	102
'04	99	98·5	99	99	100	98
'05	104·5	104	99	99	100	94
'06	97	97	98	99	100	93
'07	90	98	103	99	100	100
'08	104	106	109	99	100	99
'09	104	104	116	99	100	100·5
'10	109	105	106	99	100	101
'11	99	98	103	105	103	108
'12	104	103	108	103	102	—

TABLE XV.—LONDON. *Index numbers showing changes in wages in certain selected trades*, 1899-1912. (1911 = 100.)

Year.	Building trade.		Engineering trade.		Carters and carriers.	Dock and wharf labourers.		Furnishing trades.	
	Series A.*	Series B.†	Series A.	Series B.	Series B.	Series A.	Series B.	Series A.	Series B.
1899........	95	96·5	95	98	93	80	86	97	98
1900........	98·5	99	95	98	93·5	87	88	98·5	100
'01........	100	100	97	99	93·5	87	88	98·5	100
'02........	100	100	97	99	93·5	87	88	98·5	100
'03........	100	100	97	99	93·5	87	88	98·5	100
'04........	100	100	97	99	93·5	87	88	98·5	100
'05........	100	100	97	99	93·5	87	88	98·5	100
'06........	100	100	100	100	93·5	87	88	98·5	100
'07........	100	100	100	100	93·5	87	88	98·5	100
'08........	100	100	100	100	93·5	87	88	98·5	100
'09........	100	100	100	100	93·5	87	88	98·5	100
'10........	100	100	100	100	93·5	87	88	100	100
'11........	100	100	100	100	100	100	100	100	100
'12........	103	102	100	100	100	100	100	103	101

* Based upon changes in standard time rates, assuming that all workers eligible received the increased rate (see Table A).

† Based upon changes in standard time rates and other changes reported to the Board of Trade, assuming that only the number of workers stated to have been affected by the change received the increased wage (see Tables A and B).

TABLE XV *Contd.—Index numbers showing changes in wages.*

Year.	Compositors.		Boot and shoe opera-tives. Series B.	Railway men. Average wage.	Tailors. Series B.	General index numbers.*		
	Series A.	Series B.				Series A.†	Series B.	Mean of Series A and B.
1899	97	98·5	99·5	98	100	95	96·3	95·7
1900	97	98·5	100	97	100	96·9	97·5	97·2
'01	100	100	100	97	100	97·8	98·1	98
'02	100	100	100	97	100	97·8	98·1	98
'03	100	100	100	96·5	100	97·7	98·1	97·9
'04	100	100	100	97	100	97·8	98·2	98
'05	100	100	100	98	100	97·9	98·3	98·1
'06	100	100	100	99	100	98·3	98·5	98·4
'07	100	100	100	100	100	98·5	98·6	98·6
'08	100	100	100	97	100	98·1	98·3	98·2
'09	100	100	100	98	100	98·3	98·4	98·4
'10	100	100	100	100	100	98·4	98·6	98·5
'11	100	100	100	102	100	100	100	100
'12	100	100	100	104	100	101·6	101·1	101·4

* Obtained by combining the index numbers for the different trades and weighting according to the number of workers in London employed at them (see short notes on different trades after this table).

† When no index numbers for Series A were available the figures for Series B were used in obtaining the general index numbers for Series A.

Details of the method of calculation, source of data, &c., for the different trades.

(*a*) *Building trade.*—There are about 198,290 adult workers in the building trade in Greater London. The index numbers were based upon the changes that have taken place in the wages of bricklayers, masons and carpenters and joiners, as it has already been shown that they are representative of changes in wages of the whole trade. Fairly accurate information of changes in wages of these three grades can be obtained.

The calculation for both series of index numbers is given in full for this trade only, the method of calculations for the other trades being the same.

Series A.—Index numbers based upon changes in standard rates for the three selected grades.

Standard rates in the building trade (1900–12).*

Occupation.	Percentage of all workers in the trade.†	1899.	1900.	1901.	1911.	1912.
		Per hour.	Per hour.	Per hour.	Per hour.	Per hour.
Bricklayers	8·6	10*d.*	10*d.*	10·5*d.*	10·5*d.*	10·5*d.*
Masons	3·1	10*d.*	10·5*d.*	10·5*d.*	10·5*d.*	11*d.*
Carpenters and joiners	15·3	10*d.*	10·5*d.*	10·5*d.*	10·5*d.*	11*d.*

* See Table A.

† According to the wage census for 1906.

Weighing the rates for the three different occupations according to the percentage the workers form of all engaged in the building trade, the following index numbers are obtained :—

1899	95·0	1911	100·0
1900	98·5	'12	103·0
'01	100·0		

As has already been pointed out, these index numbers should be corrected for any change in wages due to movement from occupation to occupation inside the trade. Since there are no reliable data available for the calculation of such changes no correction could be applied.

Series B.—Index numbers based upon the changes in wages that have taken place in the three selected grades, assuming that only those stated by the Board of Trade as having been affected by the change, actually received the increased rate.

Number of adult employees in Greater London (bricklayers, &c.)	53,540
Average weekly earnings of all workers (1906 wage census)	42·04*s.*
Total weekly wage bill for 1906	2,250,760*s.*
Total increase in weekly wage bill during 1901	31,200*s.**
Total weekly wage bill for January, 1901	2,219,560*s.*
Total increase in weekly wage bill during 1900	47,840*s.**
Total weekly wage bill for January, 1900	2,171,720*s.*
Total increase in weekly wage bill during 1912	48,880*s.**
∴ Total weekly wage bill for January, 1913	2,299,640*s.*

Comparing the weekly wage bills for the various years we obtain the following index numbers :—

1899	96·5	1911	100·0
1900	99·0	'12	102·0
'01	100·0		

No change in wages took place between 1901 and 1906.

(*b*) *Engineering trade.*—Changes in wages of fitters, turners, ironfounders and patternmakers have been taken as representative of changes in wages of the whole trade. There are about 61,470 adult workers in the engineering trade as a whole.

With regard to the changes in wages that took place in 1901 and 1906 one is struck by the fact that such a small proportion of the workers eligible actually received the increased rate. An endeavour has been made to obtain some explanation of this fact, without success.

The index numbers for Series A were worked out from the data given in Table D in the manner already described for the building trade. The following additional information was used in working out the figures for Series B :—

Number of adult employees in the four grades in Greater London	18,380
Average earnings of all these workers (1906 census)	42·38*s.*

The increase in wages in 1906 took place after the returns for the wage census had been made.

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* See Table A.

(*c*) *Carters and carriers.*—There are about 58,540 employed adults in Greater London. This occupation was not included in the 1906 wage census. According to the *Cost of Living Enquiry* [Cd.–3864] for 1905 the following rates are those most usually paid in London:—Single-horse carman, 24*s.* a week; pair-horse carmen, 28*s.* a week. Accordingly 26*s.* a week has been taken as the average wage paid to carmen in 1905. As there is no recognised standard rate for these workers index numbers for Series A cannot be obtained.

(*d*) *Dock and wharf labourers.*—There are about 24,450 employed adults in Greater London. The standard rate of 6*d.* per hour has been taken as the average rate for 1900, since the wage census for 1906 does not deal with these workers. Both series of index numbers have been worked out.

(*e*) *Railwaymen.*—The details as to changes in earnings of railwaymen apply to about 45,700 workers. We only know for these workers the average wage for all workers ("boys" and adults) for England and Wales. These figures have been taken as applying to London, assuming that wages in London have varied in the same way as for the whole of England and Wales.

(*f*) *Tailors.*—There are about 25,510 employed adults in Greater London. The wages of these workers have remained unchanged during the period.

(*g*) *Boot and shoe operatives.*—There are about 19,830 employed adults in Greater London. As the only increase in wages that took place during the period is expressed as a percentage increase of the previous wage, there is no need to determine the average wage of these workers.

The standard rate for pressmen advanced 2*s.* per week during 1908, but the only change recorded in *Changes in Wages*, &c., that could correspond was one that took place in 1907 and was placed among "small changes," *i.e.*, affecting very few workers; this does not seem sufficient to warrant the advancing of the standard rate of pressmen by 2*s.* per week when they number about 1,300. The change, therefore, has been ignored in calculating the index numbers for Series B.

No index numbers for Series A have been prepared. Information of the changes in standard rates for the whole period is only available for a small proportion of the workers, and we do not know whether the changes in wages of these workers are at all representative of changes in wages of the workers as a whole.

(*h*) *Cabinet-makers, french polishers and upholsterers.*—There are about 22,860 employed adults in Greater London. The average wage of all workers in these three occupations was, according to the 1906 wage census, 36·45*s.*

The standard rate of cabinet-makers of 10*d.* per hour advanced during 1900 by ½*d.* per hour, but as only about one-half of the workers eligible received the increased wage the standard rate for 1901 was given as 10*d.* and 10½*d.* per hour (see Table A). For 1911 the standard rate is given as 10½*d.* per hour only, but no corresponding change appears in *Changes in Wages*, &c. This probably means that between 1900 and 1911 an increasing number of workers received the higher rate, so that by 1911 practically all cabinet-makers were receiving 10½*d.* per hour. Index numbers for both series have been calculated.

Compositors.—There are about 34,480 printers in Greater London, and approximately one-half of these are compositors. As the report of the wage census for the printing trade was not ready the standard rate of 38*s.* per week was taken as the average wage for 1900 when calculating the index numbers for Series B. Index numbers for Series A were also calculated.

TABLE XVI.—LONDON. *Wage index numbers for London allowing for changes in the amount of employment*, 1899-1912. (1911=100).

Year.	Index numbers of employment.*					General index number of employment.	Wage index number (London).	Wage index number allowing for changes in amount of employment.
	Engineering trade (United Kingdom).	Printing trade (United Kingdom).	Building trade (United Kingdom).	Furnishing trade (United Kingdom).	Docks (London).			
1899	100·7	101·2	103·7	102·3	111·6	103·5	95·7	99·0
1900	100·4	100·8	102·6	100·8	117·4	103·1	97·2	100·2
'01	99·4	100·5	101·4	100·4	123·9	102·6	98·0	100·5
'02	98·0	100·6	100·7	100·3	111·6	101·0	98·0	99·0
'03	98·2	100·5	100·1	99·5	100·7	99·8	97·9	97·7
'04	96·1	100·3	97·2	95·5	97·8	97·1	98·0	95·2
'05	98·0	99·9	96·5	96·9	95·7	96·9	98·1	95·1
'06	100·2	100·4	97·7	98·1	94·9	98·2	98·4	96·6
'07	99·4	100·6	97·6	98·3	94·2	97·9	98·6	96·5
'08	92·7	99·4	93·2	93·1	89·1	93·1	98·2	91·4
'09	91·3	99·3	92·9	93·7	92·8	93·0	98·4	91·5
'10	97·3	100·1	96·2	96·8	97·1	96·7	98·5	95·2
'11	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
'12	—	—	—	—	—	99·8†	101·4	101·2

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* Taken from "The measurement of employment: an experiment." *Journal*, 1912.

† Obtained by comparing the percentage of trade unionists unemployed in 1911 and in 1912, as given in the *Labour Gazette* for those years, and calculating the 1912 figure on this basis.

TABLE XVIII.—*Index numbers showing the change in the consumption per head of certain articles of food in the United Kingdom*,* 1900-11. (*Average* 1900-11 = 100.)

Year.	Meat.	Flour.	Sugar.	Tea.	Cocoa.	Currants and raisins.	Beer.†	Tobacco.†	General index numbers A.‡	General index numbers B.§
1900	105·5	98	101	98	85	81	111	96	102	100·8
'01	104	95	108	100	92	89	108	96	101·7	100·3
'02	102	101	97·5	98	100	105	106	96	100·9	100·8
'03	96	107	95	97	92	98	104·5	96	98·5	99·7
'04	100	102	98	97	100	98	101	101	100	100·1
'05	102	98	88	97	100	100	98	101	99	98·8
'06	101	102	99	100	92	107	99	101	100·8	101·0
'07	99	102·5	103	102	92	107	97·5	101	100·5	100·9
'08	99·5	95	98	100	100	100	94	101	98·3	97·9
'09	100	98	103	103	108	107	92	101	100·3	100·2
'10	95	102	99	103	115	100	92	101	98·2	99·1
'11	96	99	109	105	123	107	96	106	99·6	99·9
'12	99	103	97	105	131	103	94	106	100·8	100·6
First system of weights	51	24	12	7	2	1				—
Second system of weights	42	34	9	11	2	2		—		—

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* Taken from *Fifteenth Abstract of Labour Statistics*. The figures for 1912 were taken from the *Statistical Abstract of the United Kingdom*.

† Not including when calculating the general index numbers.

‡ Obtained by using the first system of weights, *i.e.*, weights based upon the relative amounts spent upon the different commodities by the whole population.

§ Obtained by using the second system of weights, *i.e.*, weights based upon the relative amounts spent upon the different commodities by the working classes only.

TABLE A.—*Changes in wages in London for certain selected trades*, 1900-1912.

(A) *Trades for which there is a recognised standard rate given in* Standard time rates of wages, &c.

Year during which change took place.	Workers to whom change refers.	Change as given in *Changes in wages, &c.*[a]	Number of workers affected by the change as given in *Changes in wages, &c.*	Approximate number of adult employees in Greater London, 1901.	Change in "standard rates" as given in *Standard time rate of wages, &c.*[b]	Weekly hours of labour.
Building trades[c]—				198,290		
1900	Carpenters and joiners	+ ½d. per hour	20,000	31,310	From 10d. to 10½d. per hour	50 (summer)
	Masons	+ ½d. per hour	3,000	6,150	From 10d. to 10½d. per hour	50 (summer)
1901	Bricklayers	+ ½d. per hour	15,000	17,050	From 10d. to 10½d. per hour	50 (summer)
1912	Carpenters	+ ½d. per hour	20,000	31,310	From 10½d. to 11d. per hour	
	Masons	+ ½d. per hour	3,500	6,150	From 10½d. to 11d. per hour	
Engineering trade[d]—				61,170		
1901	Patternmakers	+ 1s. per week	6,500	610	From 42s. to 43s. per week	
	Turners			1,918	From 38s. to 39s. per week	
	Fitters			11,711	From 38s. to 39s. per week	
	Smiths			1,721	From 38s. to 39s. per week	
1906	Patternmakers	+ 1s. per week	9,500	610	From 43s. to 44s. per week	
	Ironfounders			1,106	From 40s. to 41s. per week	
	Turners			1,918	From 39s. to 40s. per week	
	Fitters			11,711	From 39s. to 40s. per week	
	Smiths			1,721	From 39s. to 40s. per week	
1908	Patternmakers	—	—	610	From 44s. to 44s. and 45s. per week	
1910	Patternmakers	—	—	610	From 44s. and 45s. to 45s. per week	
1912	Ironfounders	+ 1s. per week	1,000	1,106	From 41s. to 42s. per week	
Cabinet makers, upholsterers and french polishers—				22,069		
1900	Cabinet makers	+ ½d. per hour and increased wage for overtime	8,000	13,000	From 10d. to 10d. and 10½d. per hour	52½
1910	Cabinet makers	—	—	13,000	From 10d. and 10½d. to 10½d. per hour	52½
1912	Cabinet makers	+ ½d. per hour	1,900	13,000	From 10½d. to 10½d. and 11d. per hour	
	French polishers	+ ½d. per hour	1,600	6,677	From 9d. to 9½d. per hour	
Boot and shoe operatives—				19,830		
1900	—	+ 10 per cent. of previous wage	1,000	19,830		
1907	—	+ 10 per cent. on piece rates[e] (hand sewn)	Not given	19,830		
1908	Pressmen	—	—	1,290	From 25s. to 27s. per week (minimum rates)	
Compositors—				17,240		
1901	Compositors	+ 1s. per week	9,900	17,240	From 38s. to 39s. per week	

[a] *Changes in wages and in the hours of labour in the United Kingdom.*

[b] *Standard time rates of wages in the United Kingdom.* This gives the standard rate on January 1 of each year, as well as the number of hours which constitute a "full week." The standard rates for 1912 are those given in *Changes in Wages, &c.*, as the "rate after the change had taken place."

[c] Only changes in the wages of bricklayers, masons and carpenters and joiners are given

[d] Only changes in the wages of fitters, turners, ironfounders and patternmakers are given. In 1901 and 1906 smiths are included in the original returns, and it is not possible to discover how many of the workers affected by the change belong to this class. In any case the number would only be a small proportion of the whole.

[e] Given among "smaller changes" as affecting few workers.

TABLE B.—*Changes in wages in London for certain selected trades*, 1900-12.

(B) *Trades for which there is no recognised standard rate given in* Standard time rates of wages, &c.

Year during which change took place.	Workers to whom change refers.	Change as given in *Changes in rates of wages, &c.*	Number of workers affected by the change as given in *Changes in rates of wages, &c.*	Approximate number of adult employees in Greater London, 1901.
Tailors—		No change.		25,510
Dock and wharf labourers—				21,450
1900	Dock and wharf labourers	+ 1*d.* per hour from 6*d.* to 7*d.* per hour	1,500	21,450
1911	Dock and wharf labourers	+ 1*d.* per hour from 6*d.* and 7*d.* per hour to 7*d.* and 8*d.* per hour	21,000	21,450
Carters and carriers—				58,540
1900	Carters and carriers	+ 6–9 per cent.*	7,000	58,540
		+ 2*s.* 6*d.* per week	1,250	
1911	Carters and carriers	Increase to 27*s.* for one horse† Increase to 31*s.* for two horses Increase to 34*s.* for three horses Increase to 38*s.* for four horses	55,000	58,540

* Taken as an average increase of 7·5 per cent.

† Generally recognised rates previous to 1911 were 24*s.* for one horse, 28*s.* for two horses, &c.; the increase has been taken as equivalent to 3*s.* per week for all carters and carriers affected by the change.

Average weekly earnings of railwaymen for England and Wales, 1900-12.

Year.	Average earnings per head.	Year.	Average earnings per head.	Year.	Average earnings per head.	Year.	Average earnings per head.
	s.		*s.*		*s.*		*s.*
1900....	25·58	1904....	25·58	1907....	26·40	1910....	26·30
'01....	25·52	'05....	25·87	'08....	25·52	'11....	26·69
'02....	25·44	'06....	25·96	'09....	25·87	'12....	27·37
'03....	25·37						

DISCUSSION *on* MRS. WOOD'S PAPER.

DR. GREENWOOD, in proposing a vote of thanks to the reader of the Paper, said, with regard to the statistical method adopted, he thought probably most people who had worked with index numbers would agree with the remarks made by Mrs. Wood as to the desirability of using as a base the mean of a series of years, owing to the fact that if an abnormal year were chosen, then, as the scale of movement depended on the base, incorrect or at least exaggerated ideas might be conveyed. The one disadvantage of using a mean as base—the fact that the indices did not give directly what most people wished to see in studying a Paper of that sort, viz., the actual changes from the earlier years of the series in terms of the most recent year—could be obviated by a moment's mental arithmetic, since evidently any other base could be substituted for the mean by simple division and multiplication. Another point to be remembered was that index numbers did not, as it appeared to him, furnish a final method of investigating changes. Another method of great value could be based upon graphical considerations—that is to say, if one plotted the absolute values for each commodity, each variable, and investigated the form of change, one often found that such simple graphs as straight lines fitted by the method of least squares gave one an extremely good idea of the general trend. For the purposes of the present investigation, however, the index method was unquestionably the appropriate one to employ. Turning to the results of the inquiry, there was only one section of which he anticipated a certain amount of criticism, that was the portion analyzing changes in rents. He confessed it did not seem to him, and, he gathered from Mrs. Wood's Paper, it did not appear to her, that one could form a very good idea of the change in the cost of living, so far as house rent was concerned, by indices based upon assessed values. In the first place, the distribution of the working-class population throughout London was very heterogeneous; and, in the second place, the difficulty which Mrs. Wood had pointed out, namely, the question as to whether increased rates were or were not borne by the tenants, seemed to vitiate to a considerable extent any conclusions based upon rateable values. He suggested that the other method, that of obtaining samples from house agents of the rents actually charged, was probably a better method, although it did not appear to him that sampling on a sufficiently large scale would ever be within the power of a private investigator. He thought one should remember that although the proportion of working-class income which was expended on rent might not be so large as that devoted to the other groups dealt with here, nevertheless it was a very important item, because it happened to be that portion of the expenditure which could not be temporarily diminished at will. It was an amount that had to be found. Finally, with regard to the actual interpretation of the general conclusion, he pointed out that, as Mrs. Wood remarked, it did seem a confirmation of the general accuracy of her work that Dr. Bowley's results, obtained by a totally different process of investigation and reasoning, agreed very closely indeed with hers. That being so, accepting those results as sufficient to support definite conclusions, what was the inference to be drawn as to the condition of the working classes. For example, supposing they took persons in the middle class of life, people like themselves, a diminution, say, of 5 per cent. of their incomes, assuming prices remained stationary, would not, as pointed out to him before the lecture, necessarily be detected by all of them, unless they kept their accounts carefully; and he took it the question as to what difference in one's spending powers could be regarded, in the psychologist's phrase, as liminal, depended on how far one was living from the actual minimum of subsistence. That was to say, if they took population living very near indeed to the actual minimum, a change of much less than 5 per cent. might be of catastrophic importance; so that really one wanted to combine the results of that Paper with the reports they had received upon the condition of the working classes, such as those of Mr. Rowntree dealing with York, and of Dr. Bowley with respect to Reading, in order to grasp the exact significance of the change. It seemed rather important to realise that a change of so small dimensions as 5 per cent. might really be a change of extremely large dimensions from the point of view of the comfort of existence. That being the case, another aspect of the question evidently presented itself: ought they not only to consider the question as to whether wages were in a satisfactory condition, but as to whether the instruction placed at the disposal of the working classes with regard to the utilization of their wages was at all adequate? As Fellows of the Society knew, various physiologists, and perhaps most prominently Professor Leonard Hill, had recently been arguing that the working classes did not spend their wages so far as the purchase of food supplies was concerned at all satisfactorily, which, after all, was only a confirmation of the views expressed by Mr. Rowntree in his famous inquiry. The problem seemed to be one of so much importance that it was undesirable to leave it, as it seemed to be at the present moment, in the hands of individual workers, who, encountering a certain amount of opposition, probably became more firmly attached to their particular hypotheses and less capable of modifying them; in other words, it was a question whether those fundamental physiological problems as to the cheapest and most effective dietary ought not to be taken out of the realm of private scientific investigation and speculation and put upon a national basis, and whether the importance of so doing was not very much emphasised when they were faced (as they were at present) with a diminution in the spending capacity of the working classes.

Miss Collet, in seconding the vote of thanks, said that the Paper was exceedingly valuable, above all to civil servants. It was exceedingly good and stimulating to a civil servant to know that he would be followed up carefully by the outside world, and the Paper, which had involved so much trouble, deserved very detailed attention. With regard to the question of the changes in the cost of living, she thought the value of Mrs. Wood's Paper lay in this, that it brought out a new fact quite contradictory to the conclusions drawn by some people who had used the Board of Trade Report. If she understood the Board of Trade method rightly they gave their figures for the prices usually paid in working-class districts, and their comparison of 1912 and 1905 was a comparison of the prices usually paid by the majority in 1912 with the prices paid by the majority in 1905. If Mrs. Wood was right in her figures, then the Board of Trade figures pointed to a conclusion that the working classes had raised their standard of quality. It was also very interesting to notice the difference Mrs. Wood brought out between the change in the prices of the middle-class firms and those of the working-class firms. Mrs. Wood showed that, on the whole, the middle-class firms came nearer to the Board of Trade figures than the working-class firms. In conjunction with that, she thought they would notice that, with regard to the changes in wages, the increase was greatest amongst those that had the lowest earnings. For example, if they took the dock labourer and compared the change in the index number of the cost of food with the change in the dock labourer's wages, they would see that wages went up much more than the cost of food in that class. She felt with regard to the conclusions about wages that the foundations on which they were based were too weak for them to have any validity. Knowing what they did about the change of population of London, she thought it was not permissible to assume that the figures of 1911 would bear the same relation to the figures of 1901 that those of 1901 bore to 1891. They knew that for the first time there was a decline in the population of London, and that Greater London only showed an increase of 10 per cent. Supposing the cost of food had increased even as much as 15 per cent. and wages had only increased 3 or 4 per cent., she asked whether it necessarily followed in relation to the question put by Mrs. Wood, which was not the question put in the Board of Trade return, that the prosperity of the working classes in London had diminished. Were they only to measure the prosperity by the amount the workman could extract from the employer for the same article? She thought there were other things which came into consideration. She believed that the Board of Trade standard for the index number was an average man earning between 36*s.* and 37*s.* a week and having three or four children. In most of the nine trades given, that 36*s.* or 37*s.* a week would mean that the standard chosen was that of a man whose wife and children were not earning anything. That was not a typical standard; it was a right standard to take when they were fixing an irreducible minimum. At every decade there should be a larger proportion of unmarried men and women between the ages of 15 and 25, and if they found that in the working-class districts of London there was an increased proportion of young unmarried men and women, they then had an indication of greater prosperity in the family. In such a case the cost of food might increase very greatly, and yet not overtake the increase in the family income. Both the Board of Trade and Mrs. Wood had ignored the female worker altogether. The Board of Trade volume had certain objects in view, not the one she thought they were considering there, in which the cost of living to the man supporting his family entirely himself was of importance. But Mrs. Wood was considering the changes in the prosperity of London working classes, and surely the question of the improvement or otherwise of the position of the women workers in London was of the very greatest importance. She thought London had attained certain material advantages which could be expressed in a money form, which must be taken into account before drawing conclusions about changes in prosperity. The rates and taxes paid were not entirely without anything on the other side, and during the last twelve years London, however defective its educational methods might still be, had nevertheless gone ahead as compared with previous times. It had spent far more money in making young persons efficient, and in recent years medical inspection, and a considerable amount of medical treatment, of school children had been provided. In the ordinary family also, after a certain period, the grandparents had to be considered. She did not think they could, when considering whether Londoners had lost or gained, afford to neglect the old-age pensions. Then there were such matters as the increased facilities for locomotion, which must count. During the last eight years the tramway facilities had been very greatly increased, and even such a minor detail as the fact that the tramcars had roofs must be of considerable effect on the health of those people who used to travel to their work backwards and forwards in the pouring rain. Another test which should be adopted was the test of the evils which have been prevented. She thought if they looked at the London records they would find a considerable decrease in infantile mortality, which pointed to very great improvements in many directions. Twenty-five years ago it was quite a common thing to come across a dock labourer's wife who had borne sixteen children and buried two-thirds of them, and who had become a grandmother before her youngest children were born. If the 1911 Census pointed to improvement in these respects, it could more than counterbalance any increase in the cost of food. There seemed to her to have been an increase in the self-respect of the London workman, and also London in the last twelve years had become a much brighter place. Arrangements in the parks had greatly improved; good music she believed could be heard on most Sundays. She thought the amenities of London counted very much in the matter of prosperity. She did not in the least desire to make out a case for improvement from a material point of view, but certainly her impression was that the unrest that had been referred to was largely due to the increased hopefulness of the working classes.

Mr. Yerbury said the last speaker seemed to think Mrs. Wood's investigations had been for the purpose of showing whether Londoners were better off than they were a few years ago. No one could deny that the London working man was better off than formerly, but the question was whether he was relatively better paid. They felt they were worse off, because they knew they had not been getting what they considered to be a fair share of the growing profits in every industry. The most sanguine of them saw that sooner or later the end of the period of boom must go. For the moment most people, he supposed, would agree that they were at the top of the boom, and the workman saw that if he could not at present get a rise of wages sufficient to bring him up to the position he ought to be in, his position would be worse when the slump came. There was an increase in the cost of living, and profits had been made during the last five years or ten years which were very much larger than the profits manufacturers had seen in the past, and if the workmen could not get their share of those profits by a rise now they would have to go through a good deal of suffering by striking at a time when they could not well afford to strike, and probably at a time when the masters could not so well afford to give a rise in wage except out of the profits they had made at the time of the boom. The fact that one-third of the wages of the working classes was taken up by expenditure on meat and bread had struck him very much. He thought it might be accepted that another third would be taken up by rent. Therefore on those three things two-thirds of the working man's wages were taken up. There could be little doubt if they took the rents of the working classes in London generally the working man had to pay the rise in rates and not the landlord. It might be in some places the landlord had to pay the rise in rates, because owing to the easier transit the working classes had been able to move out of London. But in places like East Ham, and as far out as Penge and other districts, the rents had not only not fallen, but the increased rates had been put on the rent, and the properties were still well let. Within an easily accessible distance he thought the working man had had to pay any rise there had been in rates, although in the central districts, such as Marylebone, it was perfectly true that the landlords had had to pay it. With regard to catalogue figures, he did not know how far it might be true that the figures in the catalogue might not be the proper figures to take, because most people could publish catalogues, and in order to save the expense of printing catalogues very often they would put a higher price than the real retail price, and vary the discount allowed off list price. As regards putting the middle-class and the working-class customers together, from his personal experience of the middle, and a very great deal of experience of the working classes, he thought it would be very unwise to do that, because with regard to almost every item of consumption the difference in prices paid by the middle classes was very much greater than the price paid by the working classes. With regard to bacon, for instance, no one of the middle classes would say it was cheap. It was one of the dearest commodities bought by the middle classes, although in the East End of London they could get very cheap bacon. On page 17 of the Paper certain figures were given with regard to the change in retail prices—sugar, for instance, in column 1. Inquiries answer to "no change," while in the other two tables there was a difference of 3 per cent. and 6 per cent. It seemed to him very strange that all the tables should not agree as to whether or not there was a change. He would have thought it quite easy where there was no change for all the tables to agree, and especially in items such as tea and sugar.

Mr. A. D. WEBB thought that the author was to be heartily congratulated on the work she had produced. The effect of the Paper seemed to be to produce a feeling of distrust towards the Board of Trade figures, which they had hitherto trusted. He would be very interested to hear any member present justify the figures of the Board of Trade if he could. In the table on page 35 the author had summarised her investigations by giving index numbers of real wages, and that was the table towards which her previous work had been leading. He had himself been interested a short time ago in the series of index numbers relating to real wages, covering the whole of the United Kingdom and not London only, which Mr. George H. Wood had published in the *Journal*. This series ended with 1902, and he had continued it by means of the Board of Trade figures of prices, wages and unemployment. Mrs. Wood's Paper implied that those figures were not to be trusted. Perhaps taken by themselves that might be so. But when he combined the three sets of figures on the lines Mr. G. Wood had laid down he got a result not very different from the result Mrs. Wood had arrived at in Table XVII. In that table the difference in the real wages or the real cost of living, so far as rents, prices and wages were concerned, between 1900 and 1912 was shown to be about 6 per cent., which was almost the difference he got when using the Board of Trade figures. So that even if the Board of Trade's index numbers were not to be relied upon separately, yet when they were combined in order to get some indication of real wages they received a very striking confirmation from the independent sets of figures Mrs. Wood had put before them. He wished Mrs. Wood had endeavoured to construct an index number of real wages based on the Board of Trade figures, to put in comparison with her own index numbers. In the section dealing with the consumption of certain articles the author had said she had omitted to include beer and tobacco in her results, because she supposed, in the case of beer, that the decreasing consumption might well be due to a spirit of temperance, and in the case of tobacco any variation might be due to the consumption of the wealthier classes of the community. He had contributed a paper to the *Journal* a few months before in which he had shown that the consumption of beer did vary very intimately with the real wages of the working classes, using up to 1902 Mr. George Wood's figures, and thereafter the figures he had just referred to. He had also had occasion to examine variations in the consumption of tobacco in relation to the variations in real wages, and he had found that in this case, too, there was a very intimate connection between the variations of the two sets of phenomena.

Mr. A. W. Flux said the Society had reason to congratulate itself on the piece of work Mrs. Wood had put before them, not only because of the interest of the work itself, but also because of a very pleasant breach of the custom that generally brought male authors only before the Society. Reference had been made by various speakers to an impression they had gathered from Mrs. Wood's figures that she challenged important sections of Board of Trade statistics as to their accuracy. He thought that at any rate certain parts of Mrs. Wood's paper did the exact opposite. She had started out by suggesting that certain modes of procedure adopted by the Board of Trade in calculating changes in wages could hardly be expected to lead to a satisfactory result. He thought that Mrs. Wood, examining the material from another point of view, came quite clearly and emphatically to the conclusion that, in each of two cases tested, in spite of her *a priori* case against their methods, the results of the Board of Trade were entirely confirmed by results obtained by her methods; that, in fact, while they might not have expected that certain special trades within the building trades would have given them results which were a fair specimen of the movement in the building trade as a whole, when they came to look at matters they found they had done so: and the same was true of the engineering trade. It seemed to him that this was rather a striking point when some speakers expressed themselves as being under the impression that the Paper on the whole amounted to a challenge of Board of Trade statistics. In another direction Miss Collet had referred to a possible interpretation of the differences between certain sets of figures that were brought forward in the Paper which had been overlooked by a later speaker. The fact that the investigation conducted by the Board of Trade into the prices most commonly paid by the working classes in various districts showed that, after an interval of seven years, there had in certain cases been no change, while index numbers applied to the average prices of articles of the same quality showed a change—a comparison of those two things, Miss Collet had suggested, might be taken to mean perhaps that the average quality of things of those kinds that the working classes were consuming had changed in the interval. It was, perhaps, as fair an inference from the figures as any other. The material that had been put before them in the Paper had rather tended to confirm one of the conclusions that was always battling for victory in his mind in regard to retail index numbers, namely, that it was impossible to give one universal interpretation to the idea of the "general level" of retail prices. Retail index numbers were among the most elusive things they could possibly get hold of. The Paper supported the view that different retail index numbers, each of which was perfectly valid, might apply to different sections of the community. It would appear that prices did not, in all probability, vary in the same way at shops serving different sections of the community. In spite of the consequent ambiguity of retail index numbers, it might nevertheless be necessary and desirable to compile them: but when they were compiled students ought not to forget what kind of figures they were handling and what kind of facts they were endeavouring to submit to measure. If they attributed to the measure a precision and a scope which did not belong to it, it was certain that they risked being led into endless confusion, and the inferences they drew would almost certainly be challenged by somebody who spoke from another point of view. These numbers must, in fact, not be treated as universal measures of one uniform movement, but as subject to those limitations of locality, &c., which were in general clearly stated by their compilers, whether officials or private investigators. Mrs. Wood had shown that the various firms that had contributed to her aggregate did not agree in the extent and sometimes even in the direction of the movement of prices which they showed. She had suggested that the retail index numbers published by the Board of Trade, being based upon one series—a series selected because it was the only available one that went back over material of the same kind for a sufficiently lengthy period—had only the support of that one series of quotations. In the Report from which she had quoted, it was stated that the evidence as to price movement furnished by that series was supported by evidence derived from other sources covering different portions of the period. The series did not stand by itself. He would not be inclined to attribute very much importance to the differences which appeared between the indices as calculated by Mrs. Wood and as calculated in the Board of Trade reports. It was, however, very interesting to them, and he thought the Society was to be congratulated on having a considerable amount of material, gathered privately, brought together in this way and reduced to order and system, if it were only for the sake of reconvincing themselves that there was more than one valid answer to the question now before them. Dr. Greenwood had referred to a point made in the Paper as to the essential nature of the difficulty that arose in selecting a single year as the base period for index numbers of the character they were dealing with. Dr. Greenwood had expressed himself quite accurately on the subject, he thought; but one or two of the expressions in the Paper did not seem to give the most important of the reasons against the single year as the basis. It was suggested that the year for which the most accurate data was obtained was one admirably suited as the basis. That was perfectly true; the more accurate the data for all years the better, and the year that they were going to select as their basis naturally ought to be that which had the least inaccuracy, because inaccuracy anywhere else would only affect the single year which was inaccurate; whereas the inaccuracy of the basis year would affect all comparison with other years. Another suggestion was that the year 1911 was a quite normal one, and therefore was a satisfactory year for a base year. He had tried to submit the impressionistic survey of the situation, that 1911 was a perfectly normal year, to the test of Mrs. Wood's own figures, which, it seemed to him, was a fair test to apply. In going through the tables on pp. 44—18 one found, taking the firms doing a working-class trade, and measuring from the year 1911 as the standard, that the average of the last ten years was 20 per cent. below that standard in the case of sugar, 10 per cent. below the standard in the case of bacon, and ran up to about 4 or 5 per cent. above the standard in one or two cases. It was exactly that which seemed to bear on the question of whether 1911 was a normal year. Viewed by the average conditions of the ten years in the several commodities, they found that the prices of some of them in 1911 were much above the normal level, and the prices of others were at or below the normal level. It might be that the commodities that were considerably above the normal level were the less important ones; but it did not appear to him to be quite clear enough to dispose of in a single sentence that 1911, judged by that test which was the real one of the question of normality, was a normal year for the purpose. Some of the individual prices that were going to affect the average index numbers were set too high, and others were set too low, because a single year was taken rather than a period of ten years. In bringing into the foreground the accuracy of the figures, the other criterion of suitability had been somewhat overlooked. It was perfectly true that the main reason why Mrs. Wood did not proceed on the basis of a long series of years at that part of her investigation was, that it was impossible to get any lengthy series. They might have to put up with the second best when they could not get the best, and that was one of the examples where Mrs. Wood had had to do it, being pressed by the circumstances of the case. Other people were pressed in the same way sometimes, and even Government departments were not omnipotent with regard to the material they could get, and they had to put up with something less than the ideal very often. That was a point which might perhaps be remembered when viewing matters from the ideal standpoint of what an absolutely omnipotent ruler might be able to obtain, if he could exact absolute truth from everybody of whom he inquired, as he could compel everybody to give him the information asked for. The difference between Mrs. Wood's indices and Dr. Bowley's index number obtained by the impressionistic method, on the one hand, and the Board of Trade index number applying to somewhat different facts obtained by strict arithmetical processes, on the other hand, had been dwelt on in the Paper. The difference did not impress him, and did not convince him that the two were right and the one was wrong. It would not matter if the two and the one were differently arranged, his opinion would still be the same. He thought the amount of evidence was not sufficient to entitle them to say that one result was right or that one was wrong: but they had two or three presentations of what were different facts, all of them bearing upon the general problem, the general solution of which was, he was afraid, beyond their powers at the present time. They had, therefore, to be thankful for every contribution they got towards that general solution which would help them not to be too much misled by any of the partial solutions with which for the present they were condemned to rest content.

Mr. Percy Wallis said, in examining the results obtained by means of index numbers, it might be interesting to refer to some other data collected by the Board of Trade which gave direct wages. Each month the wages of ten different trades, and the number of people who received them, was published in the *Labour Gazette.* If the average wage for each person was calculated they found that in 1905 it was 42*l.* per person, and in 1911 45*l.*, or an increase of about 6 per cent. He had not the data for 1912, but the figure could be obtained, and he had no doubt they would find it would be between 46*l.* and 47*l.* It seemed to him that wages were the most important price they had to deal with, and as the figures quoted represented the variation in the price of labour they ought to be considered in the formation of any index. He thought the Paper and the remarks of the speakers proved that the whole system of index numbers in use at the present time were very faulty, and if a longer period was examined than the one at present under consideration (from 1909 to 1912) they would find a much larger error. If they went as far back as 1880 the index number published by the Board of Trade was 129 as against 108 for 1910. If they could take the real, definite wages paid per year from the same years they would find an increase instead of a decrease in the price of labour. Therefore the index number must show a very distinct error in the actual purchasing power of money, which was the idea that was intended to be shown. Index numbers showed a variation in price, but did not show the variation in cost; that was the difficulty which was always vitiating the index figures. If they took the United States, where the variation had been very much bigger, they would find that in 1880 the wages were $347, and in 1910 $518. If it were the case that the price of labour had risen by that amount and yet they found the index number in England for the same period was

21 per cent. less, there must be some error somewhere, and there was a very decided necessity for a more careful investigation of the index number in use. There were also some very interesting figures collected by the French Government with regard to the coal miners of France, which gave the annual production of wealth by the coal miners and the wages that had been paid to them. An analysis of these figures showed the percentage they obtained was always round about the same amount, always increasing as the total production decreased, and always decreasing as the total production increased, varying within a range of 5 per cent. This variation in the percentage obtained in wages was shown in the period they were considering. From 1905 there was a rise in prices, and therefore there would be a decrease of the actual wages in proportion to those prices. From now forward if they had falling prices the wages would be tending to get nearer the higher percentage or equalising what appeared to be a lowering of the actual wages at the present moment. The same interesting fact of the actual rise of wages was also shown by some figures of the Co-operative Wholesale Society. In 1900 their wages were 55*l*., in 1904 they fell to 48*l*., in 1907 they rose again to 50*l*., and in 1909 they were 55*l*. The figures quoted in the Paper showed a regular advance of prices from 1900, instead of the considerable fluctuations shown by these wages, and a still larger fluctuation if the wages for 1912 were obtained.

The PRESIDENT said that Mrs. Wood's Paper appeared to him to form an important contribution to the art of measuring changes in the value of money. Methods of this kind must, of course, be used in the spirit shown by Mr. Flux, with a due sense of "probable error." Exact arithmetical agreement between index numbers constructed on different plans was not to be expected. He (the President) had been more surprised by the similarities than by the differences between Mrs. Wood's and the Board of Trade's results. As to the inferences that were to be drawn from those results when compared with changes in nominal wages, he thought that Miss Collet's observations were very valuable. He would suggest an additional consideration showing that change in "real wages" as defined in the Paper was not an exact measure of the increase in the prosperity of the working classes. Account should be had of the shortening of hours which had taken place. He would add another suggestion which was rather dialectical than statistical. If the bimetallists had been right in lamenting the drag on industry due to the fall of prices some thirty years ago, we ought now to set against the evils of rising prices the stimulus thereby given to industry.

Mrs. WOOD, in reply, referred first to the remarks of Dr. Greenwood about the index numbers for rent. She agreed with him that they were not wholly satisfactory and that the method was only a rough one. The method used by the Board of Trade in their customary inquiries was undoubtedly the more correct, but it was doubtful whether a private individual could collect the necessary information. Later in the discussion it had been suggested that rents in London had actually gone up since 1900. The result of the Board's Cost of Living Inquiries had shown that between 1905 and 1912 rents in London, taken as a whole, had actually gone down by 4 per cent. Miss Collet had pointed out that the Board of Trade, in their Cost of Living Inquiries, were not measuring quite the same thing as she was measuring in her investigation, and that the discrepancy between the two results might be due to the fact that the working classes had raised their standard of quality. She thought that this was very probably the case, since the price at which most working-class people buy, which was what the Board considered in their inquiries, depended not only upon the level of retail prices but also upon wages. Between 1905 and 1912 wages in London increased by about 6 per cent., and this would undoubtedly affect the quality of the food purchased by the working classes, although it was doubtful whether this fact alone was sufficient to explain the difference between the two results. On the other hand, both the Board's retail index numbers for food and her own index numbers measured the change in the price of the same quality, as far as possible, from year to year, and yet the two series of figures did not agree at all closely. In fact, in contrast to what had been already said, the Board's retail index numbers showed, if anything, a slightly bigger increase than the Cost of Living figures. Miss Collet had also suggested that the wage index numbers were based upon a weak foundation, but with certain modifications they were based upon essentially the same foundation as the Board's wage index numbers for the United Kingdom. Miss Collet seemed to think that the assumption that the change in the distribution of workers in the nine selected trades between 1901 and 1911 had been the same as that found for 1891–1901 had invalidated the results. The assumption had been made in connection with an endeavour to determine the change in wages due to movement from trade to trade, and as no change took place between 1891–1901 due to this cause it had been assumed that the same was true for 1901–11, and the wage index numbers had not been modified on this account. When the required volume of the 1911 Census was published it would only be the work of an hour to calculate the actual change, and in any case it was very unlikely that it would amount to more than 1 or 2 per cent. Mr. Yerbury had suggested that the working class and middle class firms should not have been combined, as the prices charged by these two kinds of firms for the same articles was very different. This was quite true, but it did not follow that the change in price was also different. It might quite well be very much the same. She did not know about catalogue prices being particularly high. She knew if they were buying from those firms they would be charged the catalogue price, except for the commodities she had mentioned, such as meat, &c., where the price changed frequently. Mr. Webb had suggested that a series of "real wages" index numbers might have been prepared from the Board of Trade figures. This had not been done, because the Board only published a wage index number for the United Kingdom and a retail index prices number for London. With regard to the remarks made by Mr. Flux, she was glad that he had pointed out that in many respects she was in complete agreement with the Board of Trade. It was only in connection with retail prices that she had disagreed with them. She thought that Mr. Flux was gloomy about the prospect of obtaining a reliable series of retail index numbers. Surely, if for any town one obtained a sufficient number of returns of the change in the prices charged by the different retailers, one must get a series of figures showing the change in retail prices for that town. It was very important that any series of retail index numbers should be based upon a number of returns, and it was for this reason that she deplored the fact that the Board of Trade had published each year index numbers of retail food prices without stating the number of returns upon which the figures were based. Mr. Flux had pointed out that these figures were supported by other series of figures, which had not, up to that time, been published by the Board. If, however, they compared the Board's Cost of Living figures with these index numbers they would find that for individual commodities the two series of figures in some cases were far from supporting one another. To take the worst case—foreign beef—between 1905 and 1912 the retail index numbers show an increase of 29 per cent. and the cost of living figures an increase of only 10 per cent. Again, with bread there was an increase of 10 per cent. against an increase of 16 per cent., and so on. She thought that it was essential for compilers of retail index numbers to be quite sure of what it was they wanted to measure and to give a full account of the methods they used. It was not possible to discover from the Board's publications whether, to take a single instance, in compiling their retail index numbers for meat and bacon they studied the change in price of all joints or only selected joints, and, if so, what joints. For almost every commodity similar difficulties arose, and it was probable that some of the differences between the two series of figures were due to different methods having been used. Once they had settled exactly what they wanted to measure and the best way to measure it, she thought that two workers ought to arrive at results that would agree more closely than did her own with those of the Board of Trade.

The following Candidates were elected Fellows of the Society:—

P. D. Bhargova.
A. R. Burnett-Hurst, B.Sc
F. W. A. Eveleigh.
C. R. Fay.
W. R. Hamilton.
W. Hazell.
E. Hoogewerf, A.M.S.T.
M. R. Sundaram Iyer.
F. W. Kolthammer, M.A.
John Koren.
J. H. Lewinski, D.Sc. (Econ.).
F. C. Ruddle, F.S.I.
J. Strong, F.S.A.A., A.C.I.S.
V. R. Thyagaraja Aiyar.
E. H. Young.

THE FOURTEENTH SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE.

BY THE HONORARY SECRETARIES.

THE Fourteenth Biennial Session of the International Statistical Institute was held in Vienna from September 9 to 13 last. Eighty-seven members were present, and a large number of official delegates and non-members. The members attending included Dr. Dudfield, Mr. Rew and Mr. Yule from Great Britain, Mr. E. H. Godfrey from Canada, and Professor R. T. Ely from the United States. The official delegates from Great Britain were Mr. Rew, representing the Board of Agriculture and Fisheries, and Mr. Flux, representing the Board of Trade. Mr. Godfrey officially represented the Canadian Government, and Captain Muirhead Collins the Commonwealth of Australia. The executive of the Institute was attenuated by a series of misfortunes. There was a vacancy among the Vice-Presidents caused by the death, since the last meeting, of M. de Foville, while one of the two remaining Vice-Presidents—M. Troitnitsky—was prevented by illness from attending. Illness also prevented the attendance of the Honorary Treasurer, Major Craigie, and the Secretary, Mr. Methorst. Consequently only two members of the Bureau—Senator Bodio, President, and Dr. von Mayr, Vice-President—were present. Professor Verrijn Stuart kindly undertook the duties of Secretary, and Mr. Rew acted on behalf of the Treasurer. When the election of the Executive took place, the General Assembly received with much regret the announcement of the resignation of M. Troitnitsky as Vice-President, and of Major Craigie as Treasurer. As the result of the election the following are the officers of the Institute for the ensuing two years:—*President:* Senator Bodio, Italy; *Vice-Presidents:* Dr. von Mayr, Germany; M. Delatour, France; Dr. Robert Meyer, Austria; *Treasurer:* Mr. Rew, Great Britain; *General Secretary:* Mr. H. W. Methorst, Netherlands. The next Session of the Institute in 1915 was appointed to be held in Brussels.

The Session was opened in the Palace of Industry by H.I.R.H. the Archduke Leopold Salvator who, in a happily-phrased address, recalled the meetings in Vienna of the Statistical Congress in 1857, and of the International Statistical Institute in 1891, and referred briefly to statistics as the science of measure and comparison, which not only gives a knowledge of social phenomena and their causes, but is also the indispensable basis of all legislative and administrative action. Reference was also made to the fact that the statistical organisation of Austria had already been considerably developed when the Congress was held in 1857, the first statistical bureau having been established in the reign of the Emperor Francis I. The Central Statistical Commission of Austria was founded in 1863, so that the present year was its fiftieth anniversary.

M. von Hussarek, Minister of Education, followed with a speech of welcome, and the President, M. Bodio, replied, thanking His Royal Highness and the Ministers present for honouring the Institute by their presence at the inaugural meeting, and then passing in review the losses the Institute had sustained since its previous meeting. M. Mischler, who had so cordially invited the Institute to hold the present meeting at Vienna, had been unexpectedly taken from them. A pupil of and collaborator with M. Inama-Sternegg, and subsequently Professor at Czernowitz, Prague and Graz, he had been finally nominated President of the Central Statistical Commission at Vienna, a position that he was fated to hold, however, but for a very short time. M. Robert Meyer, who had acted as President of the Commission before M. Mischler, had not hesitated, after acting as Minister of Finance, again to accept that office and to act also as President of the Committee of Organisation. It was to his organising ability that the Members of the Institute were indebted for the excellent preparation of their work. The most severe loss, perhaps, that they had sustained was that of their Vice-President, M. de Foville, and they had also to mourn the loss of four of their Honorary Members, Lord Avebury, Dr. Kummer, M. Millaud and Dr. John Billings, and of the Ordinary Members, MM. Dénis, Zoricic and Braf, and General Zolotareff, Director of the Central Statistical Committee for Russia. M. Bodio then outlined the work before the Institute, and concluded by contrasting the state of war in the Balkans with the idyllic atmosphere of The Hague, the city of Peace Conferences and International Arbitration. Statistics were not politics, but they might do something to avert wars by showing the extent of the burdens that they created.

Dr. Weiskirchner, Burgomaster of Vienna, having expressed on behalf of the Municipality their pleasure in receiving the Institute, Dr. Meyer spoke on behalf of the Committee of Organisation and of the Central Statistical Commission. In celebration of the Jubilee of that body there were presented to the Members of the Institute a handsome volume containing a history of the Commission, or, indeed, a history of the development of statistics in Austria; a volume of retrospective statistics of Austria and a special number of the Statistical Monatschrift.

At the business meeting which followed it was decided that the meetings of the Institute should be held in three sections:—I. Demography and method; II. Economic statistics; III. Social statistics.

The *First Section* (Demography and Method) met under the Presidency of Dr. G. von Mayr, M. March acting as Vice-President. Of the Papers presented two only were of a predominatingly mathematical character. Professor von Bortkiewicz, in a very interesting memoir, considered the frequency-distribution of time-intervals between events occurring at random during a given period. The distribution is logarithmic, and the theoretical conclusion was illustrated by a discussion of the intervals between deaths of the Members of the Institute. A number of points of detail were considered, and the argument further elaborated. Dr. Forcher illustrated the "square-root law" by evaluating the dispersion of the sex-ratios of births in the districts of Bohemia when (1) the births of a single year, (2) the births of two consecutive years were taken into account, but it cannot be said that the communication brought out any point of great novelty.

Several of the Papers presented dealt with natality, mortality and allied matters. M. Nicolaï directed attention to the recently published statistics of families in France, based in part on the Census schedules, and in part on a special inquiry relating to employees of the State and of Local Authorities. The data of the French Census of 1906, and the death certificates and divorce registers for 1906–09 were utilised by M. Huber for the construction of a table, analogous to a life-table, showing, for each year of duration of marriage, the number of marriages dissolved by death of the husband, by death of the wife and by divorce, and the number of "surviving" couples. The "probable duration" of marriage arrived at is approximately 28½ years. In the discussion it was pointed out that similar tables had been published for Italy, and might be more comparable with the French data than were the tables for Berlin utilised by M. Huber. Those who are attracted by that elusive subject, the sex-ratio of births, will be aware that the statistics of many countries exhibit a marked fall of recent years in the excess of boys. Professor Tschuprow directed attention, in a very detailed study, to the importance in this connection of the varying proportions of abortions and still-births. For abortions and still-births the proportion of males is very high—say, roughly, about 150 males to 100 females—and an increase in the proportion of abortions and still-births to the total may well bring about an appreciable reduction in the proportion of males in normal births. Statistics of abortions are not available for most countries, but in France and Italy, for example, where the excess of boys has markedly fallen, the percentage of still-births has risen, and in Norway, where the percentage of still-births has fallen, the excess of boys shows no change. Professor Tschuprow tests his thesis further by investigating the sex-ratio in different districts, for different social classes, and so forth, and the student will find his Paper of great value for the variety of data collected and the wealth of references given. The paper brought out clearly the great deficiencies in many countries of statistics respecting abortions and still-births, and led to a resolution being proposed on the subject. Discussion was, however, postponed pending the reading of Dr. Dudfield's Paper on still-births in relation to infantile mortality. Dr. Dudfield described the work that had been done by the Committee of the Royal Statistical Society, and laid before the meeting reprints of the tables appended to their report, emphasising the great variety of practice that existed, especially as regards definition, and suggesting a definition for consideration. Objection was taken to the Institute adopting a definition, as this was a matter for medical men, and ultimately a committee was appointed "to examine the existing statistics of births and still-births and to suggest any improvements that may be desirable." At the same time it was also resolved to invite the international medical organisations to draw up a definition of still-birth to afford a better basis for statistics. It is to be hoped that the efforts of the Committee may result in the improvement and unification which is so much needed.

Dr. Blaschke presented a lengthy report on the mortality of the insured in Austria at different epochs, including tables for each five-yearly periods from 1876 to 1900; the tables show a great decrease in mortality. M. Meuriot has continued his studies on great towns, the results of which have been presented at previous meetings of the Institute, and contributed his notes on the value of the term suburb in Paris, Berlin and London, and on the migratory movement in the case of Paris and London. M. Giusti also contributed a Paper on a subject which has occupied the attention of M. Meuriot, viz., the measurement of urban density, discussing the areas that should be eliminated from the denominator of the fraction from different points of view. The Paper gave rise to some debate, and a committee was appointed to consider the matter further. To M. Meuriot the Institute was also indebted for a Paper on the present state of statistics of religion. On the subject of education in statistics two papers were promised by M. Waxweiler and M. Schmid, respectively, but only the latter materialised. M. Schmid proposed that an inquiry should be made by the Institute as to the instruction given in the Universities; such an inquiry had already been carried out by the "Deutsche Statistische Gesellschaft" as regards the German Universities and the German-speaking Universities of Austria. A former committee on the matter, which had not as yet produced any report, was reappointed with some modifications. Mr. Godfrey presented a very useful and interesting report on statistical organisation in Canada, tracing the growth of the statistical work of the Dominion Government, and the need for co-ordinating or centralising many of the branches of statistical work for which the provincial governments are at present responsible. He concluded by summarising the recommendations made by the committee appointed by the Minister of Commerce in 1912. The technique and organisation of the Census of Roumania was described by M. Colesco.

M. Thirring presented the first part of the first issue of a Yearbook of Great Towns, printed at the cost of the Municipality of Buda-Pesth, and read a report indicating the difficulties he had met with in compilation. The *questionnaire* that had been circulated met with some criticism, and it was suggested that a committee might be appointed with a view to drafting a somewhat simpler programme. Ultimately a permanent committee was nominated to examine the means of developing the statistics of large towns, of rendering them more comparable, and facilitating the publication of an international annual. As regards the publication of such international volumes, all statisticians will be glad to know that the "Statistique Générale de la France" has prepared, under the direction of M. March, a sequel to the volume of International Statistics of the Movement of the Population published in 1907. The second volume will cover the years 1906–10, but the figures for 1901–05 will also be reprinted for comparison. Some new tables will also be given, including amongst other matters the statistics of divorce.

In the *Second Section* (Economics), M. Yves Guyot was appointed President, and Professor Verrijn Stuart, Vice-President. A report was presented by M. March from the Committee appointed at The Hague to consider, at the request of the International Agricultural Institute, the statistical methods of crop reporting. The conclusions of the committee did not meet with entire acquiescence, Mr. Godfrey and Mr. Rew expressing some dissatisfaction. Professor Ricci, chief of the statistical service of the International Agricultural Institute, who was present by invitation, subsequently read a Paper on international statistics of areas and production, and eventually a special committee was appointed to consider and report upon the whole question of agricultural statistics. A Paper by M. Anziferoff on some considerations on the statistics of the co-operative movement was followed by a statement by M. Pozzi of the action taken with regard to agricultural co-operation by the Agricultural Institute, and a resolution was passed affirming the importance of a statistical study of the co-operative movement, and appointing a committee to study the questions relative especially to statistics of agricultural co-operation.

Indices of economic progress formed the subject of Papers by MM. Yves Guyot, Mortara and Sorer. M. Guyot introduced a general discussion, while the other two Papers related to special studies of economic indices for Italy and Austria respectively. A committee was nominated to consider the methods appropriate to economic semiology, Mr. Yule being one of its members.

International finance statistics occupied the attention of the Section on a report by Dr. Zahn, who proposed a schedule for presenting the financial data for each nation. Difficulties arising in connection with the separation of ordinary and extraordinary expenditure, and out of the inter-relations of the finances of the State, the Province and the Municipality were discussed, and the committee which has had this subject under consideration was re-appointed to consider Dr. Zahn's schedule in detail.

M. Kiær read a Paper on the distribution of income and property, on which a discussion arose as to the proper treatment of derivative incomes. M. Wolf announced the early publication of his studies of the changes in the distribution of incomes, and the committee, whose report M. Kiær had presented, was re-appointed, and instructed to consider particularly the subject of incomes below the tax limit, the ages of the recipients of incomes, and the proper definition of the income-unit. The questions arising in the general discussion found some illustrations in M. Fahlbeck's Paper on the national wealth of Sweden, in connection with which the relative merits of the objective and subjective methods of estimating national wealth were debated.

A paper on household budgets, with references to the work of collecting such budgets which is in progress in Vienna, was read by M. Schiff, and on this subject also a committee was appointed to report at the next meeting.

M. Simiand gave an account of the general results of his studies of price movements in Western Europe in the sixteenth to the eighteenth centuries. He has taken as base period 1450–1500, and expressed prices in terms of silver.

In connection with the permanent office and its contemplated publications, a committee was appointed to watch the work of the proposed new organisation at Brussels, for collecting trade statistics in a uniform classification for all countries, the committee to consider and report upon the best manner of presenting, in the publications of the Institute, the data thus obtained.

The *Third Section*, under the presidency of Professor R. T. Ely, dealt with Papers on social statistics. The first of these was a report from the committee on municipal industrial enterprises. M. Schelle, the reporter, expressed the opinion that State socialism and municipalisation of industry had not attained the relative importance sometimes attributed to them, and dwelt on the necessity of adequate methods of accounting. He had drawn up a model form of account, and the committee was re-appointed and instructed to follow this form.

M. Cadoux then presented a Paper on the great municipal works carried out at Paris during the last 60 years, showing a total outlay of 235,000,000*l*., in addition to expenditures of an ordinary character, in that period. He expressed the opinion that statistics of the same character as those which he had prepared for Paris should be prepared for other great cities, an opinion with which the Section agreed unanimously.

A discussion on criminal statistics was introduced by M. Hoegel, who stated his belief that nothing but confusion can arise from the attempt to show in statistical form the causes of crime. Other speakers held different views, believing that it was useful to associate the occurrence of crimes with other phenomena, even if they were not assigned as its causes.

A scheme of classification of the personnel of railways and other means of transport was explained by its author, M. Wendrich, and the Section then passed to the consideration of M. van der Borght's paper on international housing statistics. A very active discussion of the difficulties presented by statistics on this subject brought out particularly the vagueness of the term "dwelling," and ended in the appointment of a committee to consider the best means of overcoming the various obstacles to a satisfactory scheme of housing statistics.

The report of MM. von Mayr and Varlez on statistics of unemployment, which was under discussion by the International Association for Combating Unemployment at The Hague, occupied the greater part of a morning sitting in this Section, the amendment of sundry details with a view to attaining a more satisfactory basis for the statistical records of unemployment being the chief matter dealt with.

The subject of woman's place in industry led to the appointment of another committee, and statistics of production and consumption of alcohol were likewise handed over to a committee, it being recalled that a committee on this subject had been set up also in 1895. A brief communication regarding the statistics of insanity in the Department of the Seine was also laid before the Section.

Statistics of industrial accidents occupied the final meeting of the Section, M. Julin describing the Belgian system as determined by its law on compensation for industrial accidents. A second Paper, by M. Fuster, dwelt on the difficulties presented in the matter of uniformity of lists of industries. M. Bellom then presented a Paper discussing international statistics of invalidity insurance, setting forth the nature of the data needed if the conditions of the problems demanding solution were to be fully met. The material at present available is, as he pointed out, very defective. A lively discussion was provoked, and the subject was entrusted to a committee which should co-operate with the permanent Committee for Social Insurance. The existence of unpublished material of importance as showing the relation of occupation to invalidity in Germany was mentioned in the course of the debate.

Passing from the work of the Sections to that of the General Assembly, the most important subject dealt with was the proposal for the creation of a Permanent Office, which has so long been under the consideration of the Institute. It will be remembered that at the close of the discussion of the matter at The Hague (*Journal*, vol. lxxv, p. 62) a committee was appointed to draw up a detailed scheme. The committee met at Rome in the spring of this year, and a report by M. March described the three principal views that had been put forward in favour respectively (1) of the formation of a permanent office of any kind; (2) of an autonomous office; (3) of an office under the authority of the Institute. The last project was favoured by the majority of the committee, and their scheme, with a few modifications,

was accepted by the Institute. As modified, the "Projet de règlement" is as follows:—

I. But.

Art. 1.

L'Office permanent de l'Institut International de Statistique a pour objet :

1°. De réunir, d'examiner et de conserver dans sa bibliothèque et ses archives les documents statistiques des différents États et des Offices internationaux. Il en extraira les données qui se prêtent aux comparaisons internationales, notamment ce qui est relatif à la démographie.

2°. De faciliter par une action permanente l'unification des méthodes, des questionnaires, des procédés de dépouillement, des modes de publication, de façon que les résultats soient le mieux possible comparables.

3°. De publier aussitot que possible un Annuaire international, un bulletin périodique et, s'il y a lieu, d'autres ouvrages, dans lesquels à côté de tableaux statistiques on trouvera une bibliographie ainsi que des notices relatives aux progrès et innovations réalisés dans certains pays et qu'il serait utile de faire connaître en détail à tous les pays.

L'emploi des langues sera conforme aux statuts et aux usages de l'Institut International de Statistique.

4°. D'aider le Bureau de l'Institut de Statistique à préparer le Programme de la session.

II. Organisation.

Art. 2.

Le siège de l'Office permanent est au siège de l'Institut International de Statistique.

Art. 3.

L'Office permanent est placé sous l'autorité de l'Institut représenté par son Bureau. Il est dirigé par le Secrétaire général.

Art. 4.

Avec l'approbation du Bureau de l'Institut, le Secrétaire général peut désigner un ou plusieurs chefs de service et le personnel nécessaire au fonctionnement du Bureau permanent.

III. Voies et moyens.

Art. 5.

Les frais de l'Office permanent seront couverts :

1°. Par une subvention de l'Institut International de Statistique dont le montant sera fixé par l'Assemblée générale.

2°. Par les subventions que le Bureau de l'Institut se chargera de demander aux États et collectivités.

3°. Par des dons et des legs.

4°. Par le produit de la vente des publications, &c.

Art. 6.

La gestion financière de l'Office permanent est complèt ment distincte de la gestion financière de l'Institut International de Statistique. Aucune des sommes à la disposition de l'Office permanent ne pourra être dépensée pour un autre objet que celui fixé à l'Art. 1.

Art. 7.

Les rapports annuels sur la gestion de l'Office permanent et les comptes annuels financiers seront présentés à chaque session de l'Institut par le Secrétaire général.

Art. 8.

En cas de liquidation de l'Office permanent l'assemblée générale déterminera l'emploi de l'actif et nommera les liquidateurs.

This brief epitome of the work of the Sessions would be incomplete without a reference to the opportunities which were so delightfully given by our Viennese hosts, with Viennese charm, for social intercourse. The "réunion intime" on the evening before the first meeting was the occasion for the pleasant foregathering of members, most of whom had not met since the Session at The Hague, and many for a longer period. On the Tuesday evening a dinner was given by the Municipality in the magnificent hall of the Rathaus, and on the following evening seats at the Opera were placed at our disposal. On Thursday an interesting excursion was made to Semmering, for long a summer, and more recently also a winter, resort of Vienna, and in the evening a reception was given by the Minister of Education, M. Hussarek, at the Palace of the Ministry, which was honoured by the presence of the Archduke Leopold Salvator, to whom a few of the members were presented. On Friday evening a reception was given at the Imperial and Royal Palace, when a large number of the members and delegates were presented to his Imperial Highness. Later in the evening a musical soirée was given at the beautiful palace of the Ministry of Finance, where some charming music was rendered and scenes from the life of Schubert were described by the Baron Hugues de Haan. The final dinner was given on Saturday evening at the Restaurant Sacher, in the Prater. During the whole week the Committee of Organisation and the Ladies' Committee were assiduous in their efforts to provide for the entertainment of the ladies and of those members who were able to find time to avail themselves of all the facilities so thoughtfully furnished for seeing Vienna and its environs. Acknowledgments are especially due to Madame Hussarek de Heulein and Madame Meyer, President and Vice-President, respectively, of the Ladies' Committee, while M. Meyer, as President of the Committee of Organisation, and Dr. Pribram, as Secretary, were as indefatigable in their attention to the comfort of members as in their exertions for the smooth working of the arrangements

for the more serious business of the Session. To name all who assisted in both respects would be impossible, but they will be rewarded by the grateful appreciation of all who participated in the memorable fourteenth session of the Institute.

The "banquet d'adieu" was on this occasion, although a farewell to our hosts at Vienna, not the signal for the complete break-up of the gathering. Many members were able to accept the cordial invitation of the Municipality of Prague and the Czech "syndicats d'initiatives" to visit their city, and never were guests made to feel more welcome. Leaving Vienna on Sunday, the members on arrival in Prague, in the evening, attended an informal reception in the beautifully decorated rooms of the Public Hall. On Monday morning there was a formal reception at the old Hôtel de Ville, and afterwards the guests were taken in tramcars through some of the interesting parts of the city and up to the Castle. After visiting the Castle and Cathedral, lunch was served on the Belvedere, with its glorious view over river and city. Another tour on the tramcars followed, and the guests reassembled for a banquet in the concert hall of the Public Hall at 5.30, from which they were conducted to the Opera House for a performance of Dvořák's "Rusalka." The following morning those who could do so visited the Statistical Bureau and the Ethnological Museum, where is preserved a collection illustrating the arts and industries of the Bohemian peasants. The visitors carried away the most delightful recollections of their welcome to the beautiful city of Prague, and to Dr. Malý in particular the thanks of the English members are due.

On the Criterion of Goodness of Fit of the Regression Lines and on the Best Method of Fitting them to the Data.

By E. Slutsky, *Lecturer in Mathematical Statistics, The Commercial Institute, Kiev (Russia).*

I.

Suppose we have an uncorrelated system of variables with the deviations from their means $x_1, x_2, \ldots \ldots x_n$ and with standard deviations $\sigma_1, \sigma_2, \ldots \ldots \sigma_n$. On the hypothesis of the normal distribution the equation to the frequency surface will be—

$$(1) \quad \ldots \ldots \ldots \quad Z = Ce^{-\frac{1}{2}S\left(\frac{x_i^2}{\sigma_i^2}\right)}$$

and the equation to the generalised ellipsoid, giving the system of equally probable values of $x_1, x_2, \ldots \ldots x_n$:—

$$(2) \quad \ldots \ldots \ldots \ldots \quad S\left(\frac{x_1^2}{\sigma_1^2}\right) = \chi^2.$$

Now the equations (1) and (2) are only particular forms of the more general expressions dealt with by Prof. Pearson in his memoir "On the Criterion that a given System of Deviations from the Probable in the Case of a Correlated System of Variables is such that it can be reasonably supposed to have arisen from Random Sampling."* We conclude, therefore, that the probability of an uncorrelated system of n errors occurring with a frequency as great as or less than that of the observed system will be given by the same expressions which have been found by Prof. Pearson in the paper cited.

Thus we shall have—

$$P = \sqrt{\frac{2}{\pi}}\int_{\chi}^{\infty} e^{-\frac{1}{2}\chi^2}d\chi + \sqrt{\frac{2}{\pi}}\, e^{-\frac{1}{2}\chi^2}\left(\frac{\chi}{1} + \frac{\chi^3}{1.3} + \frac{\chi^5}{1.3.5} + \dots\dots + \frac{\chi^{n-2}}{1.3.5.\dots\dots n-2}\right)$$

if n be odd, and

$$P = e^{-\frac{1}{2}\chi^2}\left(1 + \frac{\chi^2}{2} + \frac{\chi^4}{2.4} + \frac{\chi^6}{2.4.6} + \dots\dots + \frac{\chi^{n-2}}{2.4.6\dots\dots n-2}\right)$$

if n be even.

The values of P have been tabulated by Palin Elderton,† so that to find our P we must only enter the tables with the arguments χ^2 given above by (2), and $n' = n' + 1$.

These results we will apply to the problem of testing the goodness of fit of the theoretical regression line.

Let $y_{x_1}, y_{x_2}, \dots\dots y_{x_n}$ be the means of the x-arrays and $Y_1, Y_2, \dots\dots Y_n$ the ordinates of the regression line with the equation—

$$y = f(x, a_1, a_2 \dots\dots a_p).$$

Now it is known that there is no correlation between the deviations in the mean of an x-array and in the mean of a second x-array.‡ These deviations being—

$$e_1 = Y_1 - y_{x_1}, e_2 = Y_2 - y_{x_2}, \dots\dots e_n = Y_n - y_{x_n}$$

their standard deviations can easily be found if we know the standard deviations of y (σ_{n_x}) and the frequencies (n_x) in each x-array.

They are—

$$\Sigma_{y_{x_1}} = \frac{\sigma_{n_{x_1}}}{\sqrt{n_{x_1}}},\ \Sigma_{y_{x_2}} = \frac{\sigma_{n_{x_2}}}{\sqrt{n_{x_2}}}, \dots\dots \Sigma_{y_{x_n}} = \frac{\sigma_{n_{x_n}}}{\sqrt{n_{x_n}}}.§$$

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* *Phil. Mag.*, 5th series, vol. l, 1900, pp. 157–175.

† *Biometrika*, vol. i, pp. 155–163.

‡ Karl Pearson, "On the General Theory of Skew Correlation and Non-Linear Regression." *Drap. Comp. Research Memoirs, Biometric*, Series II, p. 13.

§ *Ibid.*, p. 14, Proposition VI.

Then we have only to form the value—

$$(3) \quad . \quad . \quad . \quad . \quad \chi^2 = S\left(\frac{e_i^2}{\sigma_{n_{x_i}}^2/n_{x_i}}\right) = S\left(\frac{n_{x_i} e_i^2}{\sigma_{n_{x_i}}^2}\right)$$

and the tables of Palin Elderton will give us (for $n' = n + 1$) the value of the probability in question.

Illustration A.

Let us investigate the closeness of fit of the cubical parabola found by Prof. Pearson for the correlation between age and head height in girls.* I take the cubic (*c*), which is considered by the author as the best, the equation to which is—

$$(4) \quad . \quad . \quad . \quad . \quad Y_{x_p} = 0{\cdot}280194 + 0{\cdot}722886\ X_p - 0{\cdot}029580\ X_p^2 - 0{\cdot}002223\ X_p^3.$$

The standard deviations, given by Prof. Pearson in 2-mm. units, I express in the same units as the heights, *i.e.*, in millimetres, and obtain the following table (see Table 1) :—

TABLE 1.—*Mean auricular height of girl's head at given age.*

Age.	Height.		Errors.	Frequencies.	Standard deviation.	
	Observed.	Calculated from cubic (c).				
x_p.	y_{x_p}.	Y_{x_p}.	$e_p = Y_{x_p} - y_{x_p}$	n_{x_p}.	$\sigma_{n_{x_p}}$.	$\frac{n_{x_p} e_p^2}{\sigma^2_{n_{x_p}}}$.
3·5	115·25	116·90	1·65	1	5·7*	0·084
4·5	116·96	117·66	0·70	7	5·7706	0·103
5·5	117·47	118·42	0·95	18	5·8552	0·474
6·5	119·10	119·24	0·14	40	5·9282	0·022
7·5	120·30	120·08	0·22	76	5·9764	0·103
8·5	121·63	120·93	0·70	125	5·2732	2·203
9·5	121·72	121·78	0·06	177	6·7754	0·014
10·5	122·82	122·62	0·20	235	5·9306	0·267
11·5	123·14	123·42	0·28	261	6·4178	0·497
12·5	123·89	124·18	0·29	309	6·4122	0·632
13·5	124·86	124·88	0·02	263	6·7178	0·002
14·5	125·71	125·52	0·19	198	7·1730	0·139
15·5	126·16	126·07	0·09	214	6·9326	0·036
16·5	126·53	126·52	0·01	162	7·7392	0·000
17·5	126·91	126·87	0·04	95	6·3358	0·004
18·5	127·02	127·09	0·07	61	6·2470	0·008
19·5	129·56	127·18	2·38	13	9·6812	0·787
20·5	123·82	127·11	3·29	7	5·0622	2·955
21·5	126·50	126·88	0·38	8	8·2828	0·017
22·5	125·25	126·48	1·23	2	1·9148	0·825
	....	....	....	2,272	....	$\chi^2 = 9{\cdot}17$

* The frequency in this group being *unity* the standard deviation equals zero (Pearson, *l.c.*, Table III). It is clear, however, that we have here an error in σ_{n_x} due to random sampling, and that it would be quite reasonable to omit this group. I prefer to maintain it, assuming for σ_{n_x} a value obtained by a rough extrapolation.

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* *Ibid.*, pp. 34–38.

Thus we find $\chi^2 = 9 \cdot 17$, $n' = 20 + 1$, and $P = 0 \cdot 98$ (from Palin Elderton's tables), and conclude that the fit is an extremely good one; then if we assume the values in the general population distributed in accordance with the cubic, the deviations due to random sampling equally improbable or more improbable than the observed ones, would occur 98 times in 100 cases.

Illustration B.

The following table (Table 2) shows the correlation between the mean monthly price of rye in Samara (y) and the mean monthly price of rye in the same town a month before (x). The headings of rows and columns give the prices in copecks per pud:—

TABLE 2.—*Correlation between prices of rye at monthly intervals.*

Prices of rye in Samara a month before.

Prices of rye in Samara. Copecks per pud.	25.	30.	35.	40.	45.	50.	55.	60.	65.	70.	75.	Totals.
75										1	1	2
70									1	4	1	6
65						1	1	3½	5	1		11½
60							2	5½	5			12½
55						3	2	2½	1½			9
50					2	19	4	1				26
45			1	2	10	2						15
40			1	2	1							4
35		3	3		2							8
30	6	13	2									21
25	3	5	1									9
Totals	9	21	8	4	15	25	9	12½	12½	6	2	124

There are one hundred and twenty-four months, covering a period of eleven years (1893–1904), eight months not being included because of a gap in the data.* We find—

Means.	Standard deviations.
$h_x = 47 \cdot 16$ copecks per pud;	$\sigma_x = 13 \cdot 93$ copecks per pud.
$h_y = 47 \cdot 04$,,	$\sigma_y = 13 \cdot 84$,,
Correlation coefficient	$r_{xy} = + 0 \cdot 93292$

and the equation to the regression line—

$$(5) \quad . \quad . \quad . \quad . \quad . \quad . \qquad Y = 0 \cdot 92689 \, X + 3 \cdot 33.$$

Let us investigate now the closeness of fit. The data are exhibited in Table 3.

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* "Prices of Commodities on the principal Russian and Foreign Markets in 1893," and the same publication for the following years till 1904. (Published yearly, in Russian, by the Department of Trade and Manufactures, now by the Ministry of Trade and Industry.)

TABLE 3.—*Mean monthly price of rye in Samara.*

Mean price for a month before.	Monthly price.		Errors.	Frequencies.	Standard deviations.	
	Observed.	Calculated.				
x_p.	y_{x_p}.	Y_{x_p}.	$e_p = Y_{x_p} - y_{x_p}$.	n_{x_p}.	$\sigma_{n x_p}$.	$\frac{n_{x_p} e_p^2}{\sigma^2 n x_p}$.
25	28·33	26·50	1·83	9	2·36	5·4
30	29·52	31·14	1·62	21	3·05	5·9
35	34·37	35·77	1·40	8	5·83	0·5
40	42·50	40·41	2·09	4	2·50	2·8
45	44·00	45·04	1·04	15	4·16	0·9
50	50·80	49·67	1·13	25	3·66	2·4
55	55·00	54·31	0·69	9	5·27	0.2
60	59·60	58·94	0·66	12½	4·45	0·3
65	62·20	63·58	1·38	12½	4·02	1·5
70	70·00	68·21	1·79	6	2·89	2·3
75	72·50	72·85	0·35	2	2·50	0·0
Total	—	—	—	124	—	$\chi^2 = 22{\cdot}2$

Thus we obtain $\chi^2 = 22{\cdot}2$, $n' = 11 + 1$, and $P = 0{\cdot}02$. It may be concluded, therefore, that the fit is not impossibly bad. If we assume the values in the general population distributed in accordance with the regression line (5), deviations due to random sampling equally or more improbable than the observed ones would occur twice in 100 cases.

It must not be forgotten, however, that the formula $\Sigma_{y_{x_p}} = \frac{\sigma_{n x_p}}{\sqrt{n_{x_p}}}$ is only approximate, and that $\sigma_{n_{x_p}}$ involved therein is the standard deviation of y in the p-th array in the general population. It follows that when using the empirical values of $\sigma_{n_{x_p}}$ errors of random sampling are made which in some, if not most, cases, tend to increase the value of the criterion χ^2. These errors may be considerable when the frequencies n_{x_p} are as small as in the Illustration B. and the question arises whether our criterion can be used in such cases.

The general solution of this problem cannot, however, be given here. We may only assume that in cases where the frequencies $n_{x_1}, n_{x_2}, \ . \ . \ . \ . \ n_{x_p}$ are great the error in χ^2 cannot be so considerable as to make idle the conclusions to be drawn from it. Further, we may suggest that when the frequencies are small the empirical values of the standard deviations ($\sigma_{n_{x_p}}$)must be graduated, at first in any reasonable manner and the values obtained in such way used in evaluating the formula for χ^2.

Returning now to our Illustration B, we find that the probable errors of the $\sigma_{n_{x_p}}$ must be so considerable that the differences between them cannot be regarded as truly significant. Thus we come to the conclusion that the distribution can be regarded as homoscedastic, the standard deviations $\sigma_{n_{x_p}}$ being probably nearly equal in the general population. The common value may be assumed to be not very different from the mean value—

$$\sigma_{n_x} = \frac{1}{N} S(n_{x_p} \sigma_{n_{x_p}}) = 3{\cdot}8022,$$

and if we substitute it in the formula for χ^2 we obtain $\chi^2 = 15{\cdot}1$, and $P = 0{\cdot}18$.

II.

The criterion of goodness of fit given above allows us to resolve the fundamental problem of the theory of fitting the regression lines to the data, *i.e.*, to find the most probable regression curve from the whole family of curves belonging to the given type. The reasoning is quite straightforward.

Given an equation to the line—

$$y = f(x, a_1, a_2, \quad . \quad . \quad . \quad . \quad . \quad a_p),$$

the most probable values of the coefficients $a_1, a_2, \quad . \quad . \quad . \quad . \quad . \quad a_p$ will be those which bring our χ^2 to its minimum. Thus we have the condition—

$$(6) \quad . \quad . \quad . \quad . \quad \chi^2 = S\left\{ \frac{n_x}{\sigma_{n_x}} \left(y_x - f(x, a_1 . a_2 \quad . \quad . \quad . \quad . \quad a_p) \right)^2 \right\} = \text{min.}$$

From the analytical standpoint the process consists in the application of the method of least squares, the weights to be given to the values being proportional to the frequencies of the arrays divided by the squares of the standard deviations. In the case of homoscedasticity ($\sigma_{n_{x_1}} = \sigma_{n_{x_2}} = \quad . \quad . \quad . \quad . = \sigma_{n_{x_p}}$), the weights will be proportional to the frequencies alone, and the method adopted by Prof. Pearson, in the memoir cited, on skew correlation will give the best results. The only difference in this case between the two methods will consist in the use of moments which enables one to fit the curve, not to the disparate points, but to the continuum. If we realise, however, the fact that in most cases of non-linear regression the arrays are not homoscedastic, we shall come to the conclusion that we must expect to obtain better (in the sense of more probable) results with the method given above than with that of Prof. Pearson.

The type equations resolving the problem, in the case of parabolæ of the *p*-th order, are easily obtainable.

Let the equation to the parabola be—

$$y = a_0 + a_1 x + a_2 x^2 + \quad . \quad . \quad . \quad . \quad . \quad a_p x^p,$$

and let us determine the coefficients $a_0, a_1, \ldots a_p$ so as to satisfy the condition—

$$(7) \quad \ldots \quad S\left\{\frac{n_{x_i}}{\sigma^2_{n_{x_i}}}\left(y_{x_i} - a_0 - a_1 x - a_2 x^2 - \ldots - a_p x^p\right)^2\right\} = \text{min.}$$

Now let us write—

$$(8) \quad \ldots \quad w_i = \frac{n_{x_i}}{\sigma^2_{n_{x_i}}}, \quad m_r = S(w_i x_i^r), \quad u_r = S(w_i y_{x_i} x_i^r).$$

Then we obtain at once the linear system—

$$(9) \quad \ldots \quad \begin{cases} m_0 a_0 + m_1 a_1 + \ldots + m_p a_p = u_0 \\ m_1 a_0 + m_2 a_1 + \ldots + m_{p+1} a_p = u_1 \\ \ldots\ldots\ldots\ldots\ldots \\ m_p a_0 + m_{p+1} a_1 + \ldots + m_{2p} a_p = u_p \end{cases}$$

The solution of which gives the required values of the coefficients.

INFANTILE MORTALITY AND THE PROPORTION OF THE SEXES.

By B. L. HUTCHINS.

IN a previous paper (*Journal*, June, 1909, pp. 210–212) I ventured to suggest that the efforts made by sanitary authorities and others to reduce mortality would have, as a secondary consequence, a reduction in the excess of women, which has been so marked a feature at recent Censuses. That excess arises, in great part at least, from the greater mortality amongst males as compared with females. If the mortality in each sex, up to any given age, be reduced in the same ratio, the relative proportion of females amongst those surviving to that age will be reduced, and the same thing will still be true even if the reduction of female mortality in some degree exceed the reduction of male mortality. The case is most clearly illustrated by a comparison of the Life Tables for England and Wales (E and F) with the Healthy Districts Life Tables (J and K) in the Decennial Supplement of the Registrar-General for 1891–1900.

Age.	England and Wales. Survivors.		Healthy districts. Survivors.	
	Males.	Females.	Males.	Females.
0	509	491	509	491
20 . .	362	364	407	404
40 . .	313	321	365	365
60	208	232	281	292

In the table for England and Wales the female survivors are slightly in excess even at age 20, and markedly in excess at age 40. In the selected healthy districts practical equality between the survivors is only attained at the latter age. Any change which will tend to make the condition of England and Wales more nearly those of the healthy districts will accordingly decrease the excess of females.

More boys are born than girls—about 104 to 100—but more boys die; consequently the excess of boys over girls in the earliest months and years of life is gradually reduced or wiped out. The rate at which this change takes place is largely dependent on the rate of mortality, especially infant mortality, which, other things equal, is very much heavier than the mortality of children. Roughly speaking, when infant mortality is high, girls predominate over boys at a very early age: when it is low, the boys remain in a majority several years longer.

A comparison of the Census, 1911, with the Census, 1901, will make this point clearer. The decade 1891–1900, it will be remembered, was a period of high infant mortality, due to an unusual proportion of hot dry summers; the decade 1901–10, on the other hand, was a period of reduced infant mortality, partly due to the low average summer heat, partly to the more stringent efforts made by the municipalities for the improvement of sanitation and other conditions relating to health. The following table shows the proportion of males and females in the earlier age-groups at the two Censuses respectively. The influence of the diminished infant mortality in the later period appears in the higher proportion of males in 1911. The children under 10 in 1901, who were the young people under 20 in 1911, are the survivors of a high infant death-rate, whereas the children under 10 in 1911 are the survivors of a comparatively low infant death-rate. The table shows an increased proportion of boys among the children aged 5–10, and a more marked increase in the proportion of boys in the children under 5, which is higher than in any Census recorded. The proportion of boys 5–10 is higher than in any Census since 1861.

Especially interesting is the comparison of the age group 10 to 15 in 1901 and 1911, which, as a contrast to the general trend of the figures, shows an increased proportion of girls in the later period, evidently related to the fact that this group in the Census, 1911, is constituted from the survivors of the highest infant mortality recorded, that of 1896–1900.

For the general interest of the matter, figures are appended for the urban and rural districts as well as for England and Wales; in the former, however, the proportions in the group over 15 are doubtless largely dependent on the demand for labour of boys and girls respectively.

It should be mentioned that the years next previous to the Census, 1911, show a slight increase in the proportion of boys born, but the variation in the proportion of male births is very small in comparison with the change in the rate of infant mortality. It can hardly be doubted that the increased proportion of boys in the child population corresponds on the whole with the reduction of infant mortality, which in its turn is largely due to the increased activity of the sanitary authorities.

	Births of males per 1,000 females.	Deaths of infants per 1,000 births.		
		Infants.	Boys.	Girls.
1891–95	1,036	151	165	135
'96–1900	1,035	156	170	141
1901–05	1,037	138	152	124
'06–10	1,039	117	129	104

Death-rate of children under 5 *and* 5–10.

	Total.		Males.		Females.	
	0–5.	5–10.	0–5.	5–10.	0–5.	5-10.
1891–95....................	57·8	4·6	62·9	4·5	52·8	4·6
'96–1900................	57·5	4·1	62·4	4·1	52·7	4·2
1901–05....................	50·2	3·8	54·7	3·7	45·8	3·8
'06–10....................	41·7	3·4	45·5	3·3	38·0	3·4

Females per 1,000 *males,* 1901 *and* 1911.

Ages.	England and Wales.		Urban districts.		Rural districts.	
	1901.	1911.	1901.	1911.	1901.	1911.
0– 5........................	1,003	991	1,005	992	996	986
5–10........................	1,005	1,001	1,009	1,005	995	988
10–15........................	1,000	1,003	1,013	1,013	961	968
15–20........................	1,019	1,016	1,063	1,063	877	865

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS

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1.—*Seventy-fourth Annual Report of the Registrar-General of Births, Deaths and Marriages in England and Wales.* (1911.) [Cd. 6578.] Fol. London: Wyman and Sons, 1913. Price 5*s.* 8*d.*

In his Annual Report for 1909 the Registrar-General announced that very considerable changes would be made in his reports beginning with that for 1911, the census year, and the results of those changes are contained in the present Report. From a volume of 522 pages, 8vo, the Report has grown to one of 577 pages foolscap. The arrangement of the matter has been completely changed, but the new volume is so great an improvement that we are more than content to accept the inevitable lack of comparability.

The two changes of the most vital importance are the adoption of the International Schedule of Causes of Death and the substitution of *administrative* areas—administrative counties, county boroughs, urban and rural sanitary districts—for *registration*—counties, districts and sub-districts—changes which very materially affect the continuity of the Reports. Of the two, the latter causes the more violent change. The substitution of the new classification of causes of death will not materially affect the more important diseases, such as the epidemic infectious diseases, the tubercular diseases and the malignant neoplasmata included under the generic title of "cancer." The manner of adjustment of the old system in use in the General Register Office to the International Schedule has been very fully explained in the *Manual of the International List of Causes of Death* issued by the Registrar-General last year. Table 19 (pp. 35 *et seq.*) of the present Report includes a tabulation of the deaths in 1911 according to the List of Causes in use prior to 1911, for each sex at all ages, for the whole country, and the figures therein set out can be compared with the tabulation according to the International Schedule, which is to be found on pp. 194–223. Table 19, in effect, enables the long series of records—they date back to 1897 in the table—to be continued, and will serve to bridge the gap caused by the changes. Table 20 does the same for the mortality rates, for males and females at all ages.

Two very great advantages can be mentioned as compensations for the *hiatus* caused by the substitution of the sanitary areas for the registration. The first is that the figures now relate to areas the boundaries and circumstances of which are well-known. Taken in conjunction with the census data it will be possible to get out statistics to which will attach the minimum of uncertainty and indefiniteness. The second advantage is that by means of the system of transference of births and deaths initiated some two years ago, the number of deaths included in the tables have been duly corrected for non-residents and out-lying births and deaths. In this way the errors attaching to rates based on registration numbers, owing to the presence of large institutions in certain areas, are obviated. The only data which have been tabulated in the Report for Registration Areas are those relating to marriage, and it is difficult to understand why that relic of the past has been retained.

The new tables of deaths by causes, in addition to those already referred to, extend to nearly 360 pages of tabulation (by sex and ages for the most part), ranging from the country as a whole, through five main divisions and administrative counties, to county and metropolitan boroughs, urban and rural districts. It would appear to be possible to take out mortality rates for the principal diseases in every sanitary area in the kingdom, distinguishing the sexes in every case, and by age-groups (more or less fine) in all the more important districts. The only areas for which no age distribution is given are the urban districts, other than county boroughs, and the rural. Pages 148 to 179 are devoted to a table showing the estimated population of every sanitary area, the numbers of births (distinguishing legitimate from illegitimate with the number of each sex), and deaths (total number), together with the rates of natality and mortality, the "standardised" death rate, standardising factor, infantile mortality and rate of increment. These figures, with the data just previously mentioned, will enable students to compile very complete tables for each and every sanitary district.

Other changes have been introduced which will increase the value of the Reports without affecting their continuity. The first and probably the useful addition to the Reports is the inclusion of Tables 2, 3 and 4, which give the estimated numbers of males and females in fifteen age-groups in: (*a*) England and Wales; (*b*) London; (*c*) aggregates of county boroughs; (*d*) aggregates of urban districts; (*e*) aggregates of rural districts; (*f*) the counties in four groups, viz., Northern, Southern, Midland, and Wales and Monmouth; (*g*) the county boroughs grouped in the same way: (*h*) aggregates of the urban and rural areas in each county; and (*i*) each county borough. The last tabulation is, perhaps, somewhat unfortunate in its limits, as it does not include such districts as the metropolitan boroughs and those somewhat numerous large areas (*e.g.*, Willesden) which are not county boroughs but contain populations much larger than many county boroughs. A selection based on population rather than civic status would have been preferable.

The tabulation of births has been improved by the distribution into legitimate and illegitimate, and males and females for every sanitary area, and the new tables (pp. 296–312) of deaths, distributed according to the class of institution in which they occur, will prove to be of great utility. The deaths due to violence (accident, suicide and murder) in the country as a whole, are classified with great minuteness by cause or method, sex and age. There are also tables giving an account of the secondary causes of death and complications recorded in deaths due to the principal infectious (zymotic) diseases.

In former Reports the term "corrected rate" has been, in accordance with custom, applied to rates obtained by the use of the factor for correction for variations in the sex-age composition of the populations. At the same time the term has been used for the rate obtained from the recorded number of deaths (or births) corrected for non-residents and deaths in out-lying institutions. Dr. Stevenson thinks that the term "standardised rate" should be adopted for the factor-corrected rate, and the term "corrected rate" be limited to the rate deduced from the registered numbers after correction for non-residents, &c. The present use of the term "corrected rate" is associated with some confusion, and the suggestion seems sound, though perhaps "nett rate" might be preferable to "corrected rate."

Two suggestions may be submitted for future consideration. It appears desirable to consider whether the matter cannot be re-arranged so as to make publication in two or more volumes feasible. As no separate pagination has been used for the "Abstracts," the tables forming that part of the Report might, with advantage for references, be numbered consecutively on from the other tables. The Registrar-General and Dr. Stevenson are to be cordially congratulated on the improvements they have made. Having regard to the magnitude and character of those improvements, no apology was needed for the delay in the issue of the Report, the preparation of which coincided with the time of greatest pressure of work connected with the recent census. R.D.

2.—*Grundriss der Statistik: enthaltend Bevölkerungs-, Wirtschafts-, Finanz-, und Handels-Statistik.* By Prof. Dr. Carl Ballod. 348 pp., 8vo. Berlin: J. Guttentag. 1913. Price 9 mks. 50 pf.

This work, which the author modestly describes as an "Outline" of Statistics, and which might perhaps more appropriately be termed a "Statistical Handbook," possesses some features which are likely to ensure it a cordial reception amongst economists and statisticians even in Germany, where the stream of statistical literature, both official and unofficial, has of late years become swollen to such an extent as to threaten an inundation. The book is founded upon a series of lectures delivered by the author (an official of the Prussian Government Statistical Department) during the years 1900–1912 at the University of Berlin. It is intended to serve, not as a substitute for lectures, but chiefly as a compendium of data that may prove helpful to students desiring to practise what they have been taught when attending the lectures. Only the most essential principles of the theory of statistics are, therefore, touched upon, while such subjects as the nature and methods of statistical investigation, and the collation of material, are treated very succinctly. On the other hand special prominence is given to the geographical, climatic, and technical conditions that have influenced the course of population and production in different countries, as revealed by the statistical tables given under those heads.

The subject-matter is presented in five sections, namely:—(I) Population; (II) Economic Statistics; (III) Public Finance; (IV) Commerce; (V) (Appendix, Various).

The treatment throughout is international in scope, and the period covered by the tables in each case is evidently the longest for which the figures could be procured after the most diligent examination of records. Thus, in the section dealing with population the figures for England and Wales commence with the year 1086, those for Spain with the year 1488, those for Italy with the year 1600, and those for Germany with the year 1620. An estimate of the population of Europe is given for various years commencing with 1350, when the figure was 100 million, and ending with 1912, with a figure of 458 million. The difficulties of international comparison of changes in the proportions of urban and rural population over a period of years are made obvious by some tables included in this section. Just about one-half of the volume is occupied by Section II, "*Wirtschafts-Statistik,*" consisting mainly of statistics of production, but with occasional paragraphs and tables relating to consumption and trade. This section, combined with that relating to population, would prove helpful to anybody desirous of studying the question as to how far the world-wide rise in prices during recent years may be due to production failing to keep pace with growth of population. For such a study, however, the usefulness of the tables would, perhaps, have been greater if the author's anxiety to avoid bulkiness had not led him to dispense with full references to the sources used in each case. A.A.W.

3.—*Inleiding tot de Beoefening der Statistiek.* By Dr. C. A. Verrijn Stuart. (Tweede Deel: De toepassing der statistische methode op de zedelijke en verstandelijke eigenschappen van den mensch.) 402 pp., 8vo. Haarlem: Erven F. Bohn, 1913. Price (bound) 7·25 fl.

In this, the second volume of his Introduction to the Study of Statistics, Dr. Verrijn Stuart discusses the use of statistical methods as applied to questions bearing upon the development of moral and intellectual qualities among nations. It will be remembered that in the first volume of his treatise (reviewed in the *Journal* for April, 1911, pp. 547–8) the author discussed the application of statistical methods in the domain of demography.

How far is it possible, with the aid of such statistical data as are at present available, to draw sound conclusions as to the level of culture, morality or intellectual development at which different peoples stand at a given time, or as to changes of level that may have taken place in any of these respects in a particular country in a given period of time? As might be expected, the prevailing note of the author's answer to this question is one of warning to the student, whom he likens to a wayfarer who, having traversed a region of comparatively firm ground (demography) has now to make his way through a morass. For when the field of inquiry is one having reference to human actions that may be regarded as the expression of psychical qualities and mental attitudes, apart from the scarcity of statistical data, there is the great difficulty of interpreting human conduct. Nevertheless, statistical methods may be usefully employed even here, "for there can be no doubt as to the existence of regularity in the quantitative relations in which those phenomena occur that are mainly governed by the intellectual and moral qualities of mankind."

The author divides his subject matter into seven chapters as follows:—(1) Religions and religious activities; (2) Sexual intercourse in its various forms; (3) Consumption as an index to moral and intellectual qualities; (4) Crime, so far as revealed by verdicts of law courts; (5) Suicide; (6) Intellectual development: and (7) Voluntary association and the composition of representative bodies.

The chapter headings in themselves, however, give only an incomplete idea of the ground covered. Thus, in Chapter 2 are discussed statistics of divorce, of legal separations, and of illegitimate births. Under Chapter 3 we find family budgets, consumption of alcoholic drinks, convictions for drunkenness, thrift, and public poor relief. By far the longest chapter, however, is that dealing with the statistics of criminality, a fact which seems inconsistent with the author's emphatically expressed view that such statistics neither do nor ever can exist in any country. A.A.W.

4.—*English Taxation*, 1640–1799: *An Essay on Policy and Opinion*. By William Kennedy, M.A. 200 pp. London: G. Bell and Sons, Ltd., 1913. Price 7*s.* 6*d.* net.

The ever-growing output of the London School of Economics in the published results of first-class research is considerably enriched by this thoroughly honest and careful piece of work, undertaken by its author during his tenure of the Shaw Research Studentship. The bare facts of the difficult period from the Long Parliament to the great income tax of Pitt were sketched in some detail by Dowell, nearly a generation ago, and, in the historical portions of his "The Shifting and Incidence of Taxation," Professor Seligman has given something of a bibliography of the early tax literature with such direct references as were necessary for the task he had in hand. With the exception of Acton and Holland's "King's Customs" there is, beyond these, practically nothing of real importance written in recent times, and Mr. Kennedy's acknowledgment of his debt to them is quite ample, for he has spared no pains to obtain a first-hand acquaintance with the whole literature of his subject. He makes no claim to have written a history of taxation, but only to have contributed an essay towards such a history, dealing with one aspect. We find, therefore, no systematic record of the imposition or repeal of specific taxes, and no comprehensive view of all the taxes existing at any one time. It was a period when we were feeling our way towards the modern position, and a bewildering succession of experiments and makeshifts comes rapidly before the student, so that he can hardly see the wood for the trees. The virtue of this work is that it has given several valuable clues to the meaning of this succession. Some of the taxes were destined to have a long life, but others were, in the words of an eighteenth century writer, like "noisome meteors." The treatment here is not by any means adequate to explain the origin and fate of each expedient, for political causes or the mere twists and turns of the party game are practically ignored. Thus we get no clue to the circumstances attending, or special pleading which was used to justify, the imposition of the Window Tax immediately after the vainglorious repeal of the Hearth Tax. Similarly the reasons—only in a limited sense economic—connected with practical productivity or unusually hazardous unpopularity, are not given more than incidental treatment. Indeed, when one has realised the author's aim, his self-restraint appears as not the least of his commendable qualities, for the taxes which, in Dowell's apt phrase, were "dropped into the fiscal pitcher to make the water rise," abound in quaint features, and it must need some firmness to prevent such a work from becoming a collection of curiosities. So the Pot Act and the vagaries of the case decisions on the Window Tax are relentlessly excluded. The fundamental and but half-realised conflict between benefit and faculty principles, and all the various conceptions of justice in distribution have been well traced through the period, while the elementary notions of incidence are brought out as clearly as their real confusion will permit. Such apparent anomalies as the persistence of the land-owning classes in supporting the old land tax, which they paid, and in opposing a general income tax, which would also have reached the commercial classes, are explained.

The fact that inconsistent or mutually destructive arguments were used against the taxation of necessaries is familiar to every one acquainted with the early history of the Excise, or with the Walpole era. The debates on the Salt Tax of 1732 are a striking instance, and historians like Smollett set out the contentions without comment upon their antagonisms. We fall into the habit of regarding them as the separate contributions of persons approaching the subject from different points of view, though with a common aim, but Mr. Kennedy brings out the fact that from one and the same person we find almost in a breath both the argument that it is cruel to the poor to tax the essentials of existence and the argument that the poor cannot really be taxed on necessaries because wages must rise and trade be burdened. This inconsistency runs right through the century, and he regards it as an example of the superficiality of thought which characterised the period. It is well illustrated from a writer not quoted by him. T. Cunningham, in the second edition of his "History of National Debts and Taxes," published in 1773, although carefully taking out most of the caustic political comment that enlivens the anonymous edition of twenty years earlier, makes a great point of the hardships of the poor, and specially preserves the following: " . . . . You are forced to bear the Bearer as well as his Share of the Burden; which will always be the Consequence of laying Taxes upon Workmen, Labourers and Servants, or upon any Thing they must necessarily consume; for such Taxes only serve to enhance the Price of Labour, and consequently the Price of every thing thereby produced, which of Course lessens our Exportation, and injures every Branch of our Trade." Just prior to this he has stated that a tax on a tenant is really a tax upon the landlord, because it disables the tenant from paying such a high rent as he otherwise might, and a tax upon consumption produces the same effect. But the public suffer unnecessarily also, because "taxes always raise price a great deal more than the tax laid on," owing to the necessity for covering interest and risk. As Mr. Kennedy says, down to about 1750, "throwing off" of taxes by the poor was put forward without argument, as obvious, but from that time the question was more in dispute. Cunningham in 1773, however, is still content with "The Labourer must live by his Wages, and he that employs him by his Profits, and if by Taxes you increase the necessary Expense of both, the former must have higher Wages, and the latter greater Profits, otherwise the one must starve and the other become bankrupt."

All ideas of taxation were conditioned fundamentally by the prevailing politico-philosophical conception of Society, and Mr. Kennedy provides an able summary of the conflicting theories. The "freeholder" conception, in which Society exists to maintain and protect existing natural rights, gradually gave place to the "functional" view of the social organism, in which rights were definitely linked with duties, and the evolution of taxing ideas can only be understood in the light of this development. J.C.S.

5.—*English farming, past and present.* By Rowland E. Prothero. 504 pp., 8vo. London: Longmans, 1912. Price 12*s.* 6*d.* net.

This is, by general consent, one of the best books on the history of English agriculture which has appeared for many a long day. The long and varied story of the development of rural England is told completely yet concisely. The author is especially well equipped for his task, combining as he does an intimate knowledge of farming and the details of estate management with scholarship and a trenchant and lucid style. So comprehensive and at the same time so readable a presentation of the whole question of the land in the light of history is especially opportune just now. The land has always been a battlefield of politics, and few of those who attempt to tell its history have avoided partizanship. Mr. Prothero deals faithfully with the facts and his judgment is always fair. Even on such controversial points as the effects of inclosure and of the Corn Laws he states the case without bias, and a student who knows no more than he finds in this book can safely form an opinion.

Mr. Prothero, in his preface, avows two convictions as the motive for writing this book. One is that the small number of persons owning agricultural land may some day make England "the forcing-bed of schemes for land nationalisation," and the other that a considerable increase of peasant ownerships, in suitable hands, on suitable land, and in suitable localities, is socially, economically and agriculturally advantageous. No one who has given serious attention to the history and economics of agriculture—and certainly not one with so profound a knowledge as Mr. Prothero—can fail to have formed an opinion on such questions as State ownership and peasant proprietorship. Unfortunately, in these days, with a preponderatingly urban population, any action which the Legislature may take is, in the long run, decided by the votes of those whose opinions on such vital questions are founded mainly on partizan literature. It is as true now as it always has been, that the interests of town and country are, at bottom, identical—that a sound policy for the rural districts is as necessary for the welfare of the townsman as of the countryman. But it is also true that never has the country been so entirely under the political dominion of the town, and that consequently the fate of the countryside rests in the hands of those who, in the nature of things, are least familiar with its needs and conditions. We might feel greater confidence in the decision of the democracy, when it deals with rural affairs, if we could feel assured that Mr. Prothero's book were carefully studied by all who have influence on public opinion. They would not all see the facts in the same light, or concur in the same conclusions, but at least they would possess an adequate knowledge of the varied history of English farming and of the complexity of the conditions under which it has been developed. They would realise that the "Land problem" is no novelty and that no solution of it can be final, that though it presents itself to each generation in a different aspect its essential elements are very similar in every age.

Mr. Prothero does not enter into the rather fruitless discussion of Domesday statistics but otherwise he makes use of such scanty statistical data as are available. He refers to Gregory King's estimates of the area, population and wealth of the country at the close of the seventeenth (misprinted "eighteenth") century, and gives them, with those of Comber and Couling, in detail in the Appendix. He refers also to the very uncertain estimates of the old Board of Agriculture at the end of the eighteenth century. He quotes recent figures of the area of land enclosed in different counties in the eighteenth and nineteenth centuries, though he omits the warning that they are only approximate estimates. Useful summary tables are given in the Appendix of the Census returns of agricultural population, the annual value of agricultural imports, the official returns of acreage and live-stock in certain years, and of agricultural wages at various dates—the latter being compiled from a number of sources.

But the charm of the book is that while it is a mine of accurate information, the learning, research and practical knowledge embodied in it are displayed in a narrative of sustained interest,and that it is as attractive to the ordinary reader as it is valuable to the student.

R.H.R.

6.—*The occupying ownership of land.* By Bevil Tollemache. 170 pp., 8vo. London: Murray, 1913. Price 2*s.* 6*d.* net.

This little book is very timely. It is deplorable that its subject should have become entangled with party politics, for it is obviously one which deserves dispassionate consideration in connection with any proposals for amending or re-adjusting rural conditions. It is curious to reflect that at one time the wide extension of "peasant proprietorship" was the pet panacea of "land reformers." Then, as now, it was opposed by practical men who believed that the landlord and tenant system, under which agriculture in this country has been developed, was best suited to our requirements, and maintained that under it an amount of capital had been employed in farming which would not have been so used under any other system. Nowadays, while the wider distribution of the land is still advocated, and the old arguments in favour of *la petite culture* are still employed, it is contended, first, that ownership is not desired, and secondly that, in the public interest, it is undesirable. The first contention is a matter of fact, the second a matter of argument, and both might well be subjected to impartial examination. Unhappily, that is now hardly possible. To those who are pledged to oppose occupying ownership it is sufficient to cite instances in which men prefer tenancy to purchase on terms which involve sinking capital; to those who advocate it the instances such as those cited in this book, where opportunities for buying land on easy terms are eagerly taken, are regarded as conclusive. To argue that no cultivators of the soil desire to own their holdings requires considerable hardihood, and it is equally difficult to deny that a large number of tenants sitting at more or less customary rents know that they are better off than they would be as owners of their farms.

Mr. Tollemache makes a very useful contribution to the discussion which well deserves the consideration of those who still keep an open mind. He describes four successful attempts to establish groups of small holdings purchased by the occupiers, with one of which he was himself associated, and in a suggestive chapter he outlines a scheme for the organisation of village farms. He also gives an account of an enterprise which proved a disastrous failure because it was conducted by a theorist obsessed with the idea that "access to the land"—any land, anywhere—is all that is necessary to enable any man, however incompetent, to make a comfortable living. He had at last, after supporting the victims of his well-intentioned scheme with lavish generosity for seven years, to admit failure, but, true to his principles, he still believes that success could be achieved if only more taxation were placed on the land.

Mr. Tollemache cites a few telling statistics, and there is a preface to his book by Mr. R. E. Prothero. R.H.R.

7.—"*Official*" *Finance in Government Departments. A series of critical comments upon the business and financial methods of Government Departments.* With an introductory note by Herbert H. Bassett, F.S.S. 173 pp., 8vo. Published by the *Financial Review of Reviews*, 1913. Price 2*s*. 6*d*.

These articles were originally published in the *Financial Review of Reviews;* it is, perhaps, doubtful whether they are adapted for book form, since the various writers (Mr. Harold Cox, Mr. Arnold Wright, Sir J. A. Baines, and the editor) are hardly supplementary to each other. The whole gives one the impression that the object was to find fault rather than to give constructive criticism; no clear conception is shown of any reforms by which the difficulties inherent in departmental administration can be overcome, except in Mr. Harold Cox's demand for a revision of the method of public accounts by which gross expenditure should be fully shown against each department. Various instances of extravagance and waste (most of them otherwise known) are given, but it is not suggested that the civil servants are either overpaid or underworked in general. The services are said not to understand business principles, and an infusion of business men (whatever exactly the words may mean) is vaguely suggested. So far as productive departments are concerned, there is, of course, the difficulty that the stimulus of profit-making is absent; but also the possibility of comparing costs with outside firms is generally absent, and the departments have generally to perform statutory duties, whatever the cost. It seems probable that the Estimates Committee of the House of Commons is as good a body as could be devised for searching for minor causes of extravagance; but there is no evident way, and these essays have none to suggest, but which a steady pressure can be exercised throughout the administrative and productive departments, so that efficient results should be uniformly secured at minimum cost.

The criticisms extend to two regions not explicitly included in the title, for one chapter is devoted to an attack on the Board of

Trade's regulations for the safety of vessels and passengers, and a considerable part of the book is a complaint of the great increase in national expenditure. We do not understand whether or not the authors think that money should not be spent on Old Age Pensions and other social schemes, or that less should be spent on defence. Supposing them to approve in general of many or all the subjects of expenditure, one would have expected them somewhere to have put the business propositions as to whether and how the results desired could have been achieved at less cost, and how far the increased expenditure on buildings, salaries, and printing which the growth of national activity involves could or should have been saved. It is no doubt expedient that attention should be called to the growing budget, but in itself it is not helpful. It is to be noticed that the growth of expenditure is nowhere compared with that either of population or of aggregate wealth. A.L.B.

8.—*Outlines of Railway Economics.* By Douglas Knoop, M.A. xvi + 274 pp., 8vo. London: Macmillan and Co., 1913. Price, 5*s*. net.

The Case against Railway Nationalisation. By Edwin A. Pratt. 264 pp., 8vo. London: Collins, 1913. Price 1*s*. net.

These two volumes make their appearance at a moment when the public mind has been attracted by the appointment of a Royal Commission to consider the relationship between the Railways and the Government.

To the theorist, Mr. Knoop's outlines should satisfy his most ardent expectations, as he seeks to draw conclusions and ideas upon which to construct theories from a very wide field. Indeed, many of his outlines have no relation whatever with Railways and the science of Railways. ·The writer himself admits in the introduction that the book is concerned almost exclusively with the positive science of economics, and that no attempt is made to cover the whole ground of Railway economics, the work being restricted almost entirely to the more theoretical aspects of the subject. But inasmuch as the theorist wishes occasionally to re-examine and compare results with fundamental principles, he will be disappointed in using Mr. Knoop's outlines as a text book for such a process. As it is the exception which proves the rule, so it is knowledge of statistical facts which proves the theory or confirms the deductions which are drawn from the facts when ascertained.

It is wide of the mark to instruct students that "Rates and Taxes" and "Government Duty" do not increase in direct proportion to an increase in traffic. The basis of Local Taxation, so far as English Railways are concerned, is directly upon the earnings of the line through each parish or union. Unless it can be shown to the Assessment Committees that the working expenses and Tenant's Capital have increased, the rateable value of the line will advance in direct proportion to the increase in Traffic earnings. Similarly, the charge for Government Duty, which is levied on all Passenger Traffic carried at rates higher than one penny per mile, advances as the volume of first or second-class traffic increases. The introduction of the National Insurance Act imposes an Imperial Tax upon the Railways of this Country, the volume of which renders, at once, obsolete the examination of any results prior to the year 1912. Mr. Knoop also lightly refers to the possibility of State ownership and management of Railways, but in a manner which is too superficial. The time has passed when the matter can be referred to in an academic manner. We have now to acquaint ourselves with the stern and inevitable effects of such a measure in the event of any Government considering the amalgamation as forming part of its programme of reforms to be effected for the welfare of the Nation at large.

Now that this problem has reached its present stage, the public demand more concise information, they demand to know the relative and incidental facts. When the State becomes the owner instead of the critic those facts will affect the community from an exactly reverse position. To-day the public, represented by the Shareholders, is the owner and the Government the critic. It is, therefore, refreshing to turn to Mr. Pratt's brochure, which deals with the negative side in a manner which is at once trenchant and forcible. Mr. Pratt has already earned sufficient distinction by his previous works on Railways to claim the immediate attention of the public to any work from his hand, especially at this embarrassing moment. It is fair to say that Railway Nationalisation is more complex in its character than Tariff Reform, and yet no less far-reaching possibilities are involved, so far as the national life is concerned. Indeed, the national considerations are rightly placed in the foremost position.

The time has arrived when Mr. Pratt with the extensive knowledge at his command should proceed to place before the public the estimated value of the anticipated disadvantages on the one side and the anticipated economies on the other. In fact, if we are ever to be able to appreciate the possible effect of State purchase, we must treat the Government in precisely the same manner as any other corporation seeking the purchase of or amalgamation with another Railway. The Government must be submitted to similar cross-examination as to its intentions and give to the Nation such tangible protective clauses as will enable the Taxpayers to judge whether or not the case for purchase has not been tremendously over-estimated.

Immense sums would require to be spent in linking up existing lines and enlarging existing workshops to deal in a concentrated form with larger quantities of Rolling Stock. Mr. Pratt's book should find its way into the hands of thousands of people who have not previously had the opportunity of making an analysis of the case, and will materially assist them in directing their minds to a consideration of that side of this important question to which their particular interest may appeal. C.L.E.

9.—*La Politique Économique Internationale.* Par Rudolf Kobatsch. Adapté et mis à jour par Guido Pilati avec la collaboration de A. Bellaco. vii + 496 pp., 8vo. Paris: M. Girard et E. Briére. 1913. Price 12 francs.

It is fitting that a book bearing this title should find a place in the admirable series of French translations of important economic treatises for which a well-known firm of Paris publishers is responsible. Its subject is "international" in a special sense, and they have accordingly added to the great service they have already rendered to economic students in various countries, comprising our own, by thus making Professor Kobatsch's comprehensive survey more accessible. He certainly entertains no narrow view of the scope, and no mean idea of the importance of his theme; and it would be difficult to dispute his pertinent contention that this large treatment of topics connected with one another, which are nevertheless usually discussed in comparative isolation, has its advantages. It becomes in consequence more possible to preserve the attitude of judicial detachment from which our author delivers his balanced opinions on vexed controversies; and he is also enabled by such liberal handling to suggest some rewarding points of view that might otherwise remain unnoticed. But it would be no less futile to deny that the method has some drawbacks. Where so much is discussed the limits even of a considerable volume like that before us must militate somewhat against the completeness of the detailed investigation, and the links of union between some of the varied matter introduced are in a few instances at least not very obvious while in others they are slight rather than intimate. An impatient critic might indeed be disposed to regard the convenient epithet "international" as an excuse for writing at large on an *olla podrida* of topics, were it not for the adroit skill with which the Viennese Professor weaves together his reasoning in his separate chapters. But his definition of his subject is at any rate sufficiently wide. It is, he tells us, the science which studies the evolution, the laws of development of ideas, the tendencies, and the measures, whether taken by the State or pursued by individuals, which concern the economic relations—the traffic of goods, the exchange of capital, the movement of migration, of foreigners and of travellers—of a country with other lands and tend to influence and regulate those relations.

In his first chapter he explains and develops this comprehensive notion. He then proceeds to discuss the appropriate method or methods of investigation, and in this chapter are some pertinent and just observations on the merits and demerits of the statistics available for this purpose, together with some acute and discriminating criticism on the various modes of study followed by economists in their inquiries. In the third chapter the method which he favours —that which is "historical" and "evolutionary"—is set forth, its application to the subject is illustrated and some fundamental conceptions are examined, such as the organisation of production, the nature of agricultural and industrial communities respectively, and the conflict and the harmony of interests which arise between different states. In the next two chapters, dealing first with the movement of persons and then with that of goods, he is careful to emphasise that the first variety, with the different aspects of emigration and immigration which are presented, is no less essential a part of his theme than the second, which has bulked most prominently in earlier discussions. However, the question of fiscal policy cannot be summarily dismissed, and to it accordingly a long chapter is devoted, in which the pros and cons of Protection and Free Trade are advanced and handled in a spirit of impartiality. The laws of evolution which can be established, and the different stages of the process through which the nations of the world pass successively in obedience to those laws, are then investigated; and a final chapter is given to other international relations besides those treated previously, such as postal and telegraphic unions, agreements respecting weights and measures, and the rules of international law. On all these multitudinous topics the Professor shows that he has been at pains to derive his information from the most extensive and authoritative sources, and on most he is able to advance some opportune suggestion or to offer some illuminating comment. He certainly produces a forcible if not convincing case for his conception and his treatment of his subject. L.L.P.

10.—*Advance India!* By M. de P. Webb, C.I.E. viii + 90 pp., 8vo. London: P. S. King and Son, 1913. Price 5*s*. net.

The author is well known through his different publications as an ardent and thoughtful student of Indian economics and finance, subjects upon which his long and successful commercial career in the most progressive part of that country entitles him to speak with authority. The present work is mainly devoted to the very complicated questions of currency and the financial relations between India and London, as determined by the Secretary of State and—a point to which the author assigns much prominence—his advisers on these matters.

A Royal Commission has been recently appointed to investigate most of the topics with which this work is concerned, and the greater part of the book is naturally taken up with this inquiry, and consists of a recital of the author's views, with the evidence and arguments upon which they are based. Owing to his position in the commercial world, and to the large amount of support in the Press of both countries which his recommendations have received, the latter will undoubtedly meet with serious consideration at the hands of Mr. Austen Chamberlain and his colleagues.

The first step in the "march forward" advocated by Mr. Webb is the abrogation of the policy of 1893, under which a gold exchange currency was established by closing the Indian mints to the free coinage of silver and admitting the sovereign as legal tender in India. For this arrangement the author would substitute a real gold currency, opening one or more of the Indian mints to the free coinage of gold into sovereigns or a local coin of equivalent value, as recommended by the Fowler Committee of 1898. Sovereigns, as he points out, have already "caught on" in popular favour throughout Upper India, and about 40 millions of them are in circulation or deposit. There is also considerable disadvantage in a currency system which does not operate automatically but is subject to official "management." Nevertheless, the system of 1893, in so far as its main object is concerned—the steadying of exchange in international dealings—has been successful, and it is beneficial to India in other respects also. The situation has been altered, no doubt, of late years by the greatly increased supply of gold, and the absorption by India of a far greater quantity than at present, which Mr. Webb anticipates will be the result of the system he proposes, would certainly influence the London market and tend, perhaps, to reduce prices. This latter factor in the case cannot, however, be restricted in its effects to the limits of the "fixed income," important as that is in India, but must be considered in relation to the assessment of land revenue and similar fiscal operations, which are based to a great extent on prices. As to the proposal regarding the opening of the mints to free coinage of gold, the trend of opinion seems more in its favour than a few years back, and it has strong support, if only as an experiment which India is entitled to make on its own responsibility; but the sketch of the vicissitudes of this question, given by the author, is an amusing and instructive example of the resources and efficiency of departmental obstruction.

In his shrewd remarks upon Indian banking, as at present conducted, the author is on firm ground. Like others who have dealt with this subject, he regrets the small proportion borne—in the case of the smaller banks—by the cash balance to the deposits, and he anticipates a good opportunity for reform in this tendency, arising out of the greater confidence in Indian enterprise amongst capitalists which would be inspired by a gold currency.

In a book he published not long ago the author dwelt at length upon the grave questions of the amount and disposal of the cash reserves of the Government of India, of the distribution of these reserves between India and London, and of the part played in the currency problem by the sales of Council Bills on Indian silver by the Secretary of State. The remarkable change in the position of Indian money in the London market which has been officially effected during the last three years, and the results thereof upon the fiscal needs of the Dependency, evidently evoked the present inquiry, the findings of which it is unnecessary to anticipate. J.A.B.

11.—*La Trasmissione Ereditaria delle Professioni.* By Federico Chessa. 136 pp., 8vo. Torino: Fratelli Bocca, 1912.

The title of this book does not fully indicate its scope. In addition to discussing the relationship between the occupations of father and son, both from the standpoint of economic theory and also by means of much statistical material, it deals with the association between calling of husband and wife before marriage and of bridegroom and father of bride. Only five of the 19 interesting tables gathered in an appendix deal directly with "hereditary transmission of profession," and a wider title would have been justified.

The data on the main question were gathered from *Who's Who* (1,550 cases), the *Dictionary of National Biography* (1,550 cases), the marriage records of Rome in 1908 (3,067 cases), and from the records of occupation of the fathers of 12,709 German University students, the particular faculty in which he was registered indicating the son's intended profession. The information for the other questions was derived from marriage records.

The statistical methods used fall under two heads: (1) in which a complete table showing all occupations is taken, and (2) in which the figures for a single occupation alone are employed and arranged in a two by two table with obvious alternative variates. In the case of (1) an index is employed which, though not in general identical with any of those based upon ideas of contingency, when applied to a two by two table reduces to the coefficient of root mean square contingency. It can only be used, however, when the number of rows and columns in the table are the same. The results obtained by dealing with single occupations appear to us to be the most interesting. Three indices have been employed for these cases. The one which is most proper for the purpose is called throughout "Gini's index," but is nothing more or less than the root mean square contingency applied to a two by two table. By this index the data from *Who's Who* and the *Dictionary of National Biography* show that the tendency for father and son to follow the same profession is greatest in the case of artists and those in the army and least for those in literature and agriculture. Not much stress can, of course, be laid upon these statements as referring to general conditions, since the publications cited refer to a stringently selected class. *Who's Who*, according to the author, shows the association between occupation of father and son to be greatest for artisans, but on referring to the table from which the index has been worked we find that only one son and four fathers fall within that group! The book would have been improved if the other indices referred to had not been employed, and we commend to the attention of the author the literature of the past two years in this country on the use of such coefficients.

With the increasing use of the new statistical methods on the continent it is inevitable that some of the formulæ long used in England should be independently rediscovered, but we confess to some surprise that the author should refer to a formula (that of the root mean square contingency applied to a two by two table) well-known and used in this country for 10 years as "recently proposed by Gini." E.C.S.

12.—*Das Sterile Berlin. Eine volkswirtschaftliche Studie.* Von Felix A. Theilhaber. 165 pp., 8vo. Berlin: Eugen Marquardt, 1913.

Herr Theilhaber devotes the first three chapters of his book to an historical sketch of the population problem; at the end of the section dealing with the ancient world he prints the following remarks in heavy type: "The history of mankind is also the history of efforts to carry out a population policy (Bevölkerungspolitik) which provides for the qualitative and quantitative development of the race agreeably to its needs. Purely economic factors have from the beginning essentially determined the limitation of births among the nations." These words convey the spirit in which the whole book is written. The fourth and fifth chapters comprise a somewhat detailed study of the fertility conditions in the city of Berlin. It is pointed out that although in the last generation the number of persons at fruitful ages and the absolute number of marriages have about doubled, the absolute number of births has diminished. The following figures indicate the magnitude of the changes:—

Year.	Number of women between 15 and 45 years of age.	Number of marriages.	Number of legitimate births.
1875	273,108	29,058	36,477
1910	560,802	43,696	34,560

The author devotes considerable space to calculations of the average number of children to a marriage, and concludes that at present nearly 50 per cent. of all marriages in Berlin do not produce more than one child and considerably more than 50 per cent. not more than two children. Some of the processes employed are not applicable to a changing population and the method of constructing the diagram reproduced on p. 59 is not, we think, satisfactory; but technical imperfections of this kind do not seriously weaken the general conclusions drawn, viz., that the rate of natural increase is altogether inadequate to maintain the population. It is also pointed out that there is no reason to suppose that, so far as natural increase is concerned, the Roman Catholics of Berlin will tend to outnumber the Protestants.

A study of the conditions in other large German towns shows that the positionof Berlin is in no way exceptional.

The remainder of the work is principally devoted to an enumertion of the causes which have led to the present state of affairs together with suggestions for remedying them. Herr Theilhaber places in the clearest light the economic factors which militate against the production of large families, such as difficulties of housing, increased obstacles to the economic exploitation of children and the effect of postponement of marriage in the middle and upper classes which is complicated by the factor of venereal disease. The author is rightly scornful of rhetoric. As he says: "Appeals to patriotism to diminish our standard of living are cheap, but cheap also in quality. With such exhortations and superficial talk we let the time run to waste in which we might be arming ourselves against disagreeable consequences." What, then, are the measures we should adopt? Herr Theilhaber's answer to this question is, *primâ facie*, simple. The State must see to it that the economic position of the parents is not worsened by the advent of a child. "Let us," he says, "put the matter practically. Let the labourer be promised that the children shall not involve him in further expenses, indeed that in the event of his children flourishing he shall receive yearly præmia, allowances for housing, &c. One can easily imagine that under such circumstances the labourer will gladly renounce the hinderance of births by complicated and dangerous methods which may mean prison or penal servitude for him, loss of health for his wife, and that he would also give much out of his own pocket to bring up State, that is, model children (Staatskinder d. h. Prachtkinder)."

The purist may, perhaps, detect in the passage we have quoted some trace of that rhetoric the use of which by others Herr Theilhaber reprobates. The truth is, of course, that this question of "Bevölkerungspolitik" bristles with difficulties. As the author points out, many a promising scheme has been placed on the statute book of a nation by rulers whose legislative genius was inferior to that of no living thinker; one after another these plans have failed. Will the collective wisdom of our own times be adequate to provide a solution of the problem? Given that the declining birth rate is mainly due to conscious limitation and that the immediate factor is an economic one, can we be sure that any modification of the latter consistent with the existence of organised society will arrest the decline? These are questions which inevitably present themselves to the mind of a student of the fertility problem.

Herr Theilhaber's book is a useful contribution to the literature of this subject, and we strongly recommend it to the notice of the many well meaning persons who consider it to be their duty to make pronouncements upon "race suicide"; were the effect of such a perusal to silence even a small percentage of these orators, Herr Theilhaber would deserve our heartiest thanks. M.G.

13.—*Other New Publications.**

Bellom (*Maurice*). La Prévoyance légale en faveur des Employés. Exemples suivis d'une série de conclusions pratiques. 108 pp., 8vo. Paris: G. and M. Ravisse, 1913. Price 2 frs. 50 c.

[The author, while opposed to compulsory insurance, thinks that as provision has been made in several countries for the insurance of workmen, such provision should also be made for clerks and others dependent on their earnings who do not come within the scope of existing systems of compulsory insurance. In the case of Germany, under the new law of 1911, insurance has been so extended, and in Austria the insurance of this class preceded that of the labouring classes. The author examines these two systems in detail, and his conclusions form the final chapter of this interesting study.]

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* See also "Additions to the Library," page 132, *sqq*.

Bellom (Maurice). La Statistique internationale de l'Assurance contre l'Invalidité. Rapport présenté et propositions soumises à l'Institut International de Statistique. 35 pp., 8vo. Vienne: F. Jasper, 1913.

[A report on methods of dealing with sickness insurance in different countries, excluding sickness arising from accidents.]

——— Le Chèque en France. Une Réforme désirable. 23 pp., sm. 8vo. Paris: G. and M. Ravisse, 1913.

Brown (William). M.A., D.Sc. The essentials of Mental Measurement. vi + 154 pp., 8vo. Cambridge: The Cambridge University Press, 1911. Price 3*s.* 6*d.* net.

[Portions of this book originally formed a doctorate thesis and were privately printed in 1910: the other chapters were written with a view of producing a concise account of the various quantitative methods employed in psychology. The slightly controversial nature of the work is intentionally retained, and the author is alone responsible for the views expressed therein. It is hoped that the book will be of value to the educationist as well as to the psychologist. The book is divided into two parts, the first dealing with psycho-physics, and the second with correlation. There are also appendices of tables and curves, a bibliography and a subject index.]

Colajanni (Napoleone). Il Progresso Economico. L' Italia di oggi. Serie 1. 272 and 135 pp., 2 vols., sm. 8vo. Rome: C. A. Bontempelli, 1913.

[These volumes are the first of a series dealing with the social and economic conditions of Italy at the present time. The book deals specially with agricultural and industrial production, trade, means of communication, thrift, consumption of food, wages, banking, state finance, and private wealth.]

Darbon (A.). Le Concept du Hasard dans la Philosophie de Cournot. Étude Critique. 60 pp., 8vo. Paris: Félix Alcan, 1911. Price 1*s.* 9*d.*

Dowding (W. E.). The Tariff Reform Mirage. With Introduction by Right Hon. Sir John Simon, K.C., M.P., and Cartoon by Max Beerbohm. xii + 351 pp., sm. 8vo. London: Methuen and Co., 1913. Price 3*s.* 6*d.* net.

[A ten years' history of the agitation for tariff reform, compiled by a free-trader from the declarations and publications of those in favour of tariff reform.]

Dublin (Louis I.). The Registration of Vital Statistics and Good Business. 15 pp., 8vo. New York: Metropolitan Life Insurance Company, 1913.

[An analysis of the value of trustworthy vital statistics to the health officer in the discharge of his duties.]

Estey (J. A.). Revolutionary Syndicalism. An Exposition and a Criticism. With introduction by L. Lovell Price, M.A. xxxi + 212 pp., 8vo. London: P. S. King and Son, 1913. Price 7*s.* 6*d.* net.

[Largely devoted to explaining how Syndicalists propose to emancipate the labouring classes, and the social order they would set up to replace the one they would destroy. The value of these proposals is also estimated. The origin and growth of the movement in France, and its spread under somewhat different guise to other countries, is described.]

Gaskell (*Thomas Penn*). Protection paves the path of prosperity. An exposure of free food folly and fiction. xii + 147 pp., 8vo. London: P. S. King and Son, 1913. Price 3*s.* 6*d.* net.

[The author is in favour of taxing foreign food supplies. The condition of agriculture in this country compared with agriculture in France and Germany is considered. Estimates are given of the revenue which might be raised from protective duties on agricultural produce and manufactured goods. There is a diagram of wheat statistics for the period 1822-1912.]

Girault (*Arthur*). La Réfection du Cadastre. 212 pp., sm. 8vo. Paris: Larose and Tenin, 1913. Price 3 frs.

[The author's object in writing this book is to give a simple and clear description of the routine to be followed in obtaining a renewal of the land survey of any village or district requiring such a measure. The book is divided into sixteen chapters, dealing with, among other matters, the necessity for such renewals and their advantages, the cost and method of obtaining financial help from the State under the "Boudenoot" law of 1898, and its importance in relation to land valuation. There is a table showing the dates of the last surveys of the different "communes" in France, some of which go back to 1728.]

Giretti (*Edoárdo*). I trivellatori della Nazione. N. 4. L'attualita politica. 164 pp., 8vo. Rome: Libreria Politica Moderna. Price 1 lire.

Hirst (*F. W.*). The Six Panics and other Essays. vii + 271 pp., sm. 8vo. London: Methuen and Co., Ltd., 1913. Price 3*s.* 6*d.* net.

[The author's object in writing the essays on the "six panics," which give the title to this volume, is to "prevent the abominable waste of public money in which a successful panic always ends." In the remaining eleven essays the author touches upon matters, sufficiently varied, which have interested him in the last few years. Certain portions have already appeared in the *Economist* and elsewhere.]

Hutchins (*B. L.*) and *Harrison* (*A.*). History of Factory Legislation. With Preface by Sidney Webb, LL.B. Second Edition revised with new chapter. xvi + 304 pp., 8vo. London: P. S. King and Son, 1911. Price 6*s.* net.

[The first edition of this book was reviewed in the *Journal* for March, 1903. The present edition has been revised and brought up to date, and a new chapter added. During the past eight years factory legislation has made marked progress, one of the most important events therein being the passing of the Trades Boards Act of 1909.]

Johnston (*R. M.*), Tasmania. Results of a Special Investigation of the Primary Causes which determine the Production and Distribution of Consumable Wealth, with an inquiry regarding the Dominant influences which Determine Prices, and the "Purchasing Power" of Labour over Commodities. 10 pp., 8vo. Hobart: John Vail, 1913.

Joseph (*Leopold*). Evolution of German Banking. 124 pp., sm. 8vo. London: C. and E. Layton, 1913. Price 3*s.* 6*d.* net.

[The substance of four lectures delivered at the London School of Economics dealing with (1) the economic development of Germany since 1800; (2) land and mortgage banks, co-operative societies and savings banks; (3) the Reichsbank, the Seehandlungen, and the money market, and (4) the "Grossbanken" and their relation to commerce and industry. The treatment of these subjects does not claim to be exhaustive, but simply a rough sketch of the evolution, principles and methods of German banking.]

Key (*Dr. Helmer*). La Vie Economique de la Suède. 166 pp., 8vo. Paris: Plon-Nourrit and Co., 1913. Price 2*s.* 6*d.*

[The author published in 1909 a pamphlet on the economic condition of Sweden, which is now out of print. Owing to the changed conditions of that country, a new edition would have required re-casting. Hence the present book, which is on different lines, and gives in detail a general account of the development and of the economic and financial condition of the country.]

Lethbridge (*Sir Roper*). The Indian Offer of Imperial Preference. With introduction by Right Hon. Austen Chamberlain. xii + 171 pp., 8vo. London: P. S. King and Son, 1913. Price 2*s.* 6*d.* net.

[Advocates a system of preferential tariffs with the United Kingdom and the Colonies.]

Lusk (*Hugh H.*). Social Welfare in New Zealand. The result of twenty years of progressive social legislation and its significance for the United States and other countries. vi + 287 pp., sm. 8vo. London: W. Heinemann, 1913 Price 6*s.* net.

[This book deals with the condition of New Zealand and its people, chiefly during the past twenty years, and with the legislation which embodied the several social and economic experiments made by the country during that period. The author was formerly a Member of Parliament for New Zealand, and is largely responsible for its present system of education.]

Mackay (*Thomas*). The Dangers of Democracy. Studies in Economic Questions of the Day. With introduction by Sir Arthur Clay, Bart. 328 pp., sm. 8vo. London: John Murray, 1913. Price 6*s.* net.

[This volume consists of articles contributed to the *Quarterly Review* between the years 1894 and 1909 by the late Mr. Mackay, in which he discusses social problems of the day and criticises the attempts made to solve them by Act of Parliament. Sir Arthur Clay, in an introductory note, remarks that the conclusions arrived at by the author are not quite in harmony with modern sentiment, but in view of his life-long study of social questions, the fact that his views clash with popular opinion makes it all the more desirable that they should be known. The book is divided into nine chapters, dealing with such subjects as trades unionism and its modern development, wages and savings of working men, the minimum wage, municipal socialism and the reform of the poor law.]

Mataja (*Victor*). Zur Geschichte der Arbeitsstatistik in Österreich. 44 pp., 8vo. Brünn: Friedr. Irrgang, 1913.

[A short history of labour statistics in Austria before and since the foundation of the Austrian Labour Department, with an account of the Department and its labours for the improvement of labour statistics generally.]

Monkswell (*Lord*). The Railways of Great Britain. viii + 303 pp., 8vo. London: Smith, Elder and Co., 1913. Price 6*s.* net.

[A clear and readable account of English railways in their administrative and general working on a more comprehensive scale than the author's earlier book on French railways. Interesting information as to the organization, rolling stock, and engine power of each of the principal railway companies is given, and interspersed among these accounts are informing remarks on State railways and the results of State ownership in other countries, railway rates and fares, the wages paid and conditions of railway employees. A preface explaining the scope of the book would have added to its value.]

Necco (Achille). Il problema della Popolazione in Italia. Perchè la natalità declina piu rapida in Pièmonte e Liguria. 45 pp., 8vo. Torino: Societa Tipografico Editrice Nazionale, 1913.

[A statistical study of the economic and social causes of the more rapid decline of the birth-rate in Pièmonte and Liguria than in other provinces of Italy.]

Penson (T. H.). The Economics of Everyday Life. A First Book of Economic Study. Part 1. xiii + 176 pp., 8vo. Cambridge: The Cambridge University Press, 1913. Price 3*s.* net.

[The author's endeavour has been to supply a book in which the essential features of the subject are described and explained, and which would be suitable for upper forms of schools or for social workers and others who are taking up the subject for the first time. The present volume deals only with production, exchange, and distribution; the remaining divisions of the subject, namely, consumption, taxation, trades unions and co-operative societies, will be dealt with in a second volume.]

Pesch (Dr. A. J. Van). Tables de Mortalité déduites des données de la période 1900-09. xvi + 43 pp., 4to. La Hague: Gebrs. Belinfante, 1912.

[These tables of mortality are based on the results of the censuses of 1899 and 1909, and on the number of births and deaths during the intervening period. They are in continuation of three earlier tables for the period 1870-79, 1880-89, and 1890-99 by the same compiler. The present tables deal with the total population of Holland distinguishing sex, and there is also a table for the large towns of over 20,000 inhabitants for each sex separately.]

Poisson (Ernest). La Cooperation nouvelle. 65 pp., 8vo. Paris: Marcel Rivière and Co., 1914. Price 75 c.

[A short account of the co-operative movement in France and of the changes that are taking place therein. Co-operation in relation to the treatment of employees, and in relation to the increased cost of living is also discussed.]

Prenger (Dr. Georg). Die Unehelichkeit im Königreich Sachsen. Ergänzungshefte zum Deutschen Statistischen Zentralblatt. Heft 4. 119 pp., 8vo. Leipzig: B. G. Teubner, 1913.

[A statistical study of illegitimacy in Saxony based on official data going back for the last seventy or eighty years, with several charts and diagrams illustrative of the subject.]

Raffalovich (Arthur). La Marché Financier. Année Économique et Financière, 1912-13. 22nd volume. 888 pp., 8vo. Paris: Félix Alcan, 1913. Price 15 frs.

[The present edition of this well-known book is generally on the same lines as its predecessors, the statistics being brought up to date. The general survey of financial and economic events in Europe, the United States and Japan during the past year, which precedes the detailed accounts of each of these States, is of great value for reference.]

Rubinstein (J. S.). The Land Transfer "Scandal." The interests of the public *v.* the tyranny of officialdom. 3rd edit. viii + 96 pp., 8vo. London: Sweet and Maxwell, Ltd., 1913. Price 2*s.* 6*d.*

[This book deals with the system of compulsory registration of title, to which the author is opposed.]

Taylor (Gerard C.). Statistical Ready Reckoner. 409 pp., 8vo. Reading: Bradley and Son, Ltd., 1913. Price 12*s.* 6*d.* net.

[The compiler having found the value of a short set of tables constructed with the view of facilitating the calculation of statistical rates required in his work, decided to complete a series which would be applicable to any given population.]

Williams (Aneurin). Co-Partnership and Profit-Sharing. vi + 256 pp., sm. 8vo. London: Williams and Norgate, 1913. Price 1*s.* net.

[The author's endeavour is to give a general idea of the co-partnership and profit-sharing movement, to which he has devoted much attention. The book deals with the movement not only in England but also in France and the United States.]

Yerbury (John E.). Short History of the Pioneer Society in Co-operative Housing. (The Tenant Co-operators, Limited, established 1888). 65 pp., 8vo. London: The Tenant Co-operators, Ltd., 1913. Price 1*s.*

Austria. Denkschrift der k.k. Statistischen Zentral-Kommission zur Feier ihres Fünfzig-jährigen Bestandes. 228 pp., la. 8vo. Wien: The Central Statistical Commission, 1913.

[This volume has been issued to commemorate the jubilee of the foundation of the Central Statistical Commission of Austria. It gives an historical and descriptive account of the official statistics of Austria before 1863, and of the changes and developments therein since that date. Short biographies with portraits are given of the former presidents of the Commission, and there is a beautiful frontispiece in colours of Vienna as it was in 1828.]

——— Résumé rétrospectif de la statistique de l'Autriche. xxix + 99 pp., 8vo. Wien: The Central Statistical Commission, 1913.

[This "résumé," prepared by the Central Statistical Commission of Austria on the occasion of the jubilee of its foundation, was laid before the members of the International Statistical Institute at their meeting in Vienna this year. It is a useful compilation of statistics of a general nature for a long series of years, classed under twenty-six heads, with descriptive notes on the tables in French and German.]

Germany. Beiträge zur Arbeiterstatistik. Nr. 12. Gebiete und Methoden der Amtlichen Arbeitsstatistik in den wichtigsten Industriestaaten. vii + 695 pp., 8vo. Berlin: Carl Heymann, 1913.

[A report on the scope and methods of the official labour statistics of the principal industrial countries. It is supplemental to two earlier reports issued by the Department of Labour Statistics of the Imperial Statistical Bureau in 1904 and 1908. The countries dealt with are the United Kingdom, the United States, France, Italy, Belgium, Holland, Austria and Germany, and for each of these, information is given as to the methods of dealing with such subjects as the state of employment, unemployment, migration, strikes and lock-outs, rates of wages and hours of labour, conditions of employment of women and children, home work, prices of food and housing, and cost of living generally.]

——— Graphisch-Statistischer Atlas der Stadt Nürnberg. la. 8vo. Nürnberg, 1913.

[This volume, which has been compiled by the Municipal Statistical Bureau of Nurenberg, gives the latest statistics, illustrated by cartograms and diagrams, of the city in relation to area and population, births, deaths, infant mortality, housing and rents, and other subjects of municipal interest.]

Italy. Censimento degli Opifici e delle Imprese Industriali al 10 giugno 1911. Vol. I. Dati raissuntivi concernenti il numero, il personale e la forza motrice delle imprese censite. (Tav. 1.) 247 pp., fol. Rome: G. Bertero, 1913. Price 2 lire.

[This volume summarizes the results of the first industrial census taken in Italy, and gives for each town the numbers of factories and workshops classed under seven heads, and also the numbers employed and the horse power used. Information is given as to what constitutes a factory, and as to how the numbers of employees were compiled and the horse power computed. There is a table at the end of the volume summarizing the results for the Kingdom.]

—— Banca Commerciale Italiana. Cenni statistici sul movimento economico dell' Italia. Progresso economico dell' Italia nel 1893-1912. 258 pp., sm. 8vo. Milano: Capriolo and Massimino, 1913.

[A compilation of general statistical and other information showing the economic development of Italy during the past twenty years. The volume has been compiled and issued by the Commercial Bank of Italy, Milan.]

Japan. Taiwan (Formosa). The Statistical Summary of Taiwan. 457 pp., 8vo. Tokyo: The Japan Time Press, 1912.

[This book gives a general outline of the administration of Taiwan, or Formosa, as it was called before its cession to Japan by China in 1895. The information and statistics are grouped under thirty-three heads, and refer mainly to the fiscal year 1911-12, though in many cases information is given for a series of years, together with index-numbers and percentages. There are numerous photographs.]

Spain. Museu Social de Barcelona. Anuari d'Estatistica social de Catalunya. I. 1912. 165 pp., 8vo. Barcelona: Eduard Navas, 1913.

[This volume is the first of its kind issued by the "Social Museum" of Barcelona, and gives in a handy form statistics as to social conditions in Catalonia, as far as these are obtainable. Among the subjects dealt with are population, emigration, industrial accidents, wages and hours of labour, strikes, prices of commodities and illiteracy.]

Charity Organisation Society. Food Prices in London. An Enquiry into Present Conditions as Affecting the Poorer Classes of Workers. 35 pp., 8vo. London: The Charity Organisation Society, 1913. Price 2*d.*

[This inquiry is based upon the information obtained from some fifty or sixty informants, mostly in humble walks of life, and social workers living in poor districts, who were asked to note the prices paid during the period from February 15 to March 9, 1913. It was assumed at the outset of the inquiry that the lowest prices were paid on Saturday night and Sunday forenoon, but this view was qualified considerably by the information obtained. A brief account is given of other compilations of retail prices, notably those of the Board of Trade, and these figures are compared with those of the present inquiry. Several working-class budgets are given.]

Yearbook of Social Progress for 1913-14. Being a Summary of Recent Legislation, Official Reports, and Voluntary Effort, with Regard to the Welfare of the People. 595 pp., sm. 8vo. London: T. Nelson and Sons, 1913. Price 2*s.* net.

[This is the second annual record of social progress in all parts of the United Kingdom, and has been considerably enlarged. Professor W. J. Ashley contributes a suggestive introduction on the progress of the year, and an index has been provided to facilitate reference.]

CURRENT NOTES.

The trade returns for November are fairly satisfactory. Imports have declined in value by 2,514,353*l*., but exports of home produce and manufactures have advanced by 1,307,801*l*. The month contained one working day less than November, 1912. The subjoined tables compare the returns of the twelve months ending November, 1913, with the twelve months ending November, 1912:—

[000's omitted.]

Imports.	Twelve months ending November, 1913.	Twelve months ending November, 1912.	Increase (+).
Imports, value c.i.f.—	£	£	£
I. Food, drink and tobacco	289,914,	279,946,	+ 9,968,
II. Raw materials and articles mainly unmanufactured	285,375,	269,244,	+ 16,131,
III. Articles wholly or mainly manufactured ...	193,657,	183,729,	+ 9,928,
IV. Miscellaneous and unclassified (including parcel post)	3,053,	2,893,	+ 160,
Total merchandise ..	771,999,	735,812,	+ 36,187,
Imports of bullion and specie	74,839,	67,678,	+ 7,161,

[000's omitted.]

Exports.	Twelve months ending November, 1913.	Twelve months ending November, 1912.	Increase (+) or decrease (−).
Exports of produce and manufactures of the United kingdom, value f.o.b.—	£	£	£
I. Food, drink and tobacco ...	31,978,	32,824,	− 846,
II. Raw materials and articles mainly unmanufactured	69,150,	58,970,	+ 10,180,
III. Articles wholly or mainly manufactured ...	411,606,	382,780,	+ 28,826,
IV. Miscellaneous and unclassified (including parcel post) ...	10,859,	9,971,	+ 888,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	15,767,	15,065,	+ 702,
II. Raw materials and articles mainly unmanufactured	63,680,	66,900,	− 3,220,
III. Articles wholly or mainly manufactured	29,586,	29,138,	+ 448,
IV. Miscellaneous and unclassified (including parcel post) ..	135,	171,	− 36,
Total, British, foreign and colonial	632,761,	595,819,	+ 36,942,
Exports of bullion and specie	68,202,	60,816,	+ 7,386,

[000's omitted.]

Shipping.	Twelve months ending November, 1913.	Twelve months ending November, 1912.	Increase (+).
	Tons.	Tons.	Tons.
Total, British and foreign, *entered* with cargoes	49,082,	45,632,	+ 3,450,
Total, British and foreign, *cleared* with cargoes	67,513,	61,792,	+ 5,751,

Mr. Sauerbeck's index-number* of prices for June, as stated in the last number of the Journal, was 84·1. There was a rise in July, August and September to 84·2, 85·0 and 85·7 respectively, a fall to 84·5 in October, and a further fall to 83·3 in November. Taking food and materials separately, the cause has been as follows:—

	June.	July.	August.	September.	October.	November.
Food	77·3	77·2	76·2	76·5	75·5	74·9
Materials	89·0	89·4	91·5	92·4	91·1	89·4

The *Economist* number was as follows:—June, 2669; July, 2689; August, 2693; September, 2714; October, 2684; November, 2661.

According to the Board of Trade *Labour Gazette*, the state of the labour market since last May has been as follows:—

	Trade unions making returns. Net membership.	Reported as unemployed.	
		Number.	Percentage.
June, 1913	921,564	17,888	1·9
May, 1913	910,692	17,138	1·9
June, 1912	833,940	20,698	2·5
July, 1913	926,787	17,935	1·9
June, 1913	921,564	17,888	1·9
July, 1912	863,546	22,222	2·6
August, 1913	933,318	18,664	2·0
July, 1913	926,787	17,935	1·9
August, 1912	872,817	19,556	2·2
September, 1913	942,559	21,801	2·3
August, 1913	938,318	18,664	2·0
September, 1912	877,811	18,785	2·1
October, 1913	948,601	20,857	2·2
September, 1913	942,559	21,801	2·3
October, 1912	885,100	17,822	2·0

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* Given in the *Statist*.

Compared with a year ago employment generally showed some falling off from the high level of that time. The decline was especially noticeable in the pig-iron, iron and steel, and tinplate trades.

The proceedings of the British Association at Birmingham in the Economic Science and Statistical Section included a number of Papers of statistical interest, but the papers contributed were, as usual, mainly economic in character. In addition to the Rev. P. H. Wicksteed's presidential address on "The scope and method of "political economy in the light of the 'marginal' theory of "distribution," noteworthy contributions were made by Lord Shuttleworth and Mr. W. M. Acworth on "The Improvement and "Unification of English Waterways" and "A Forward Canal Policy: "its economic justification" respectively. Lord Shuttleworth urged that not only would the railway traffic be increased through the development of the output of inland factories by the unification and improvement of waterways (under the direction of a Waterway Board, similar in constitution to the Road Board), owing to the cheaper transport of raw materials, &c.; but the transfer of industries to the coast and subsequent loss of railway rates would be arrested. Mr. Acworth's object was to show that canals as a means of transport are necessarily and inherently inferior to railways: that canals could not carry cheaper than railways if the total cost of carriage were taken into consideration; that canals could only compete with railways if, as in France and in Germany, the competition were subsidised and a large part of the cost of canal carriage laid on the shoulders of the taxpayer, and that therefore a forward canal policy had no economic justification. Mrs. Frances Wood dealt with the construction of index-numbers to show changes in the cost of the principal articles of food of the working-classes on lines described in another portion of the JOURNAL. Professor Irving Fisher, in a Paper entitled "What an International Conference on the high cost "of living would do," pointed out that a movement for an international conference on the high cost of living had been active for the last two years. It had received the support of the President and ex-President of the United States, the President of France and many high officials of other countries, such as England, Canada, Germany, Austria, Italy, &c. If such a conference were called it would discuss and formulate the problems which needed solution and refer them to committees appointed for the purpose of investigating them and reporting later to the Conference. These problems fell under five heads: problems of fact, of causes, of past evils, of future prospects, of remedies. The great conflict of opinion at the

Conference would doubtless be as to whether the rise of prices meant an inflation of money and credit or a scarcity of goods. If the result of its investigation should indicate that the rise of prices was chiefly a monetary phenomenon, that would indicate the importance of a monetary remedy, such as some plan for "standard-"ising" monetary units, *i.e.*, "stabilising" the general level of prices. But whether or not any such far-reaching remedy could be applied or even recommended, there were other and less ambitious remedies in the way of saving waste which ought to be carefully considered. Such, for instance, were the conservation of natural resources, the elimination of unnecessary middlemen, the introduction of co-operation where economies could thereby be effected, the improvement of banking systems, the removal of high tariff walls, &c. Mr. J. B. C. Kershaw, in a Paper on "Trade Unions and Co-partner-"ship," discussed the statistics of the co-partnership movement in the light of the facts and figures given in the latest Government report on profit-sharing and labour co-partnership in the United Kingdom [Cd.-6496, 1912. Price 8½*d.*], and then dealt with the causes of past failures, more especially with the objections of the trades unions and their leaders to all extensions of the movement beyond its present limited field of application. The author's proposals for overcoming trades-union hostility were:—First, perfect freedom for all workers to join their respective unions if so inclined; secondly, recognition of trades-union rates of pay as basis of the co-partnership scheme; and, lastly, election of selected labour leaders in each industry and locality as directors of large firms or companies.

A Report has been issued by the London County Council on "London and the Imperial Exchequer" [No. 1620. Price 1*s.* 6*d.*], as the result of an instruction from the Finance Committee to the Comptroller to bring up to date the information contained in previous reports with regard to the relations between the Council and the Government in the matter of grants from the Imperial Exchequer. In the course of the Report certain matters are touched upon which have arisen since the former reports were prepared. After devoting a section to the effects of recent and proposed legislation, the Comptroller summarizes London's financial grievances against the Exchequer under two headings, viz., first, those which London has in common with other local authorities, and, secondly, those which are special to London. Among the grievances discussed is the loss suffered by London in consequence of defects in the original scheme of assigned revenues. It is estimated that London should have received 28 per cent. instead of 22 per cent. of the revenues apportioned on the basis of discontinued grants; this would have increased London's revenue, on the average, by about 200,000*l*. As regards the liquor license duties, the proportion of duties on retail liquor licenses raised in London since the new scale of duties came into force is 22 per cent. of the total, instead of 13 per cent. as in 1908-09. If London received 22 per cent. of the fixed grant based upon the amount raised in 1908-09 it would receive an additional annual income of about 140,000*l*., and it is therefore argued that London's loss in consequence of defects in the original scheme of assigned revenues amounts to 340,000*l*. The loss suffered through the diversion of assigned revenues (*e.g.*, the increasing amount deducted under the Tithe Rentcharge (Rates) Act, 1899) is given as 54,702*l*. The loss of rates directly due to the increase in the duties on licensed premises is estimated at 129,000*l*., and the loss of water-rate in this connection at 17,000*l*. per annum. Taking into account the inadequacy of the education grants, the inadequacy of grants from the Road Improvement Fund, and the cost of new national services and new developments of old services (education, police, Unemployed Workmen Act, 1905, and Finance Act, 1908), a total figure of 540,000*l*. is arrived at for deficiencies of revenue, and of 1,236,000*l*. for new burdens on the rates. Detailed criticism is directed *inter alia* against the apportionment of the Road Improvement Fund between England, Scotland and Ireland which, it is urged, should be on the basis of the amounts contributed instead of on the basis of population. It is further claimed that in the allocation of grants regard should be had to the needs of the various areas, which are better indicated by expenditure on roads than by population; that the carrying out of works to which the Road Board does not contribute should not be made a condition of grants from the fund; and, lastly, that assessable value should not be taken into account in the distribution of grants.

A Parliamentary Paper on "Old Age Pensions and Aged "Pauperism" [Cd–7015. Price 4½*d*.] has been issued with a view of showing with reference to England and Wales some of the principal statistics which bear upon the decline in aged pauperism in recent years, and its relationship to the operation of the Old Age Pensions Act. The statistics of the number of paupers over 70 years of age have not been continuous; but a return was obtained on the subject in 1906, by the Royal Commission on the Poor Laws, &c., and further returns have been obtained by the Local Government Board for a date in January in each of the years 1910, 1911, 1912 and 1913. The general results of these returns are reproduced in the Paper. The payment of old age pensions began in January, 1909; but until December 31, 1910, the actual receipt of poor law relief (other than relief in medical or surgical assistance only) at any time after January 1, 1908, constituted a disqualification for the receipt of an old age pension. Consequently, the returns of pauperism on January 1, 1910, included a large number of persons who were prevented from receiving pensions solely because they had received poor law relief. On and after January 1, 1911, however, the removal of the disqualification arising from the previous receipt of relief had the effect of greatly reducing aged pauperism; but as the removal from the relief lists did not take place immediately, but extended over some weeks following January 1, 1911, the effect of the lapse of the disqualification is more fully shown in the return for January 1, 1912. The first portion of the tables given relates to old age pensions, and shows for each of the areas mentioned (*i.e.*, the administrative counties, the county boroughs, and the divisions of London)—(i) the number of pensioners in March, 1912; and (ii) their proportion in terms of "per thousand" (*a*) to the general population of each area; and (*b*) to the septuagenarian population of the area. It also gives the estimated amount of the cost of old age pensions for the preceding year in each area, together with an approximate indication of the amount in the pound at which a poor rate would have to be levied over the whole area in order to raise an equivalent sum. According to the Census of 1911 the number of persons in England and Wales of 70 years and upwards represented 29·7 per 1,000 of the population. The return shows that the number of old age pensioners in March, 1912, was 17·8 per 1,000 of the total population and 600 per 1,000 of the population over 70 years of age. Considerable variations exist between the proportions of old age pensions to the total population in the several counties and county boroughs and divisions of London, the number ranging from 9·4 per 1,000 in Hampstead to 40·8 per 1,000 in Cardiganshire. In the urban areas the number is for the most part less than 20. The highest number in an urban area is 27·9 at Great Yarmouth. The ratios are generally higher in the counties than in the boroughs and divisions of London, but there is one remarkable exception, namely, the county of Glamorgan, where the proportion is 9·9 per 1,000 of the population. In most of the extra-metropolitan administrative counties the number was over 20 per 1,000. Of the total number of persons in England and Wales who are over 70 years of age three-fifths are old age pensioners. The proportion ranged, in the urban areas from 267 per 1,000 in Bournemouth to 778 per 1,000 in Bermondsey, and in extra-metropolitan administrative counties from 448 per 1,000 in Surrey to 801 per 1,000 in Northampton-shire. The total sum paid as old age pensions in the year 1911-12, for England and Wales, as a whole amounted to 7,948,016*l.*, being equivalent to a rate of 9*d.* in the pound. For Wales taken separately the equivalent rate is 11*d.* The amount for the administrative county of London as a whole is represented by a 4*d.* rate and for other administrative counties the corresponding figure ranges from 6*d.* to 2*s.* 9*d.* in the pound. In the counties of Cornwall, Norfolk, West Suffolk, Anglesey, Cardigan and Pembroke the equivalent rate is upwards of 2*s.* In county boroughs the amount varies between 4*d.* and 1*s.* 7*d.* in the pound.

The second portion of the Paper contains the results of returns received at five different dates with respect to the number of indoor and outdoor paupers over the age of 70. The areas for which the figures are given are (*a*) poor law unions, and (*b*) "union counties," *i.e.*, groups of poor law unions. The following table gives the principal comparative figures, viz.:—

Paupers over 70 years of age in England and Wales.

	In-door.	Out-door.	Total.
March 31, 1906	61,378	168,096	229,474
January 1, 1910	57,701	138,223	195,924
,, 1, '11........................	55,261	93,177	148,438
,, 1, '12	49,370	9,530	58,900
,, 4, '13	49,207	8,563	57,770
Percentage decrease between 1906 and 1913	*19·8*	*94·9*	*74·8*

The corresponding percentage decreases in Wales (with Monmouth) alone were: in-door, 13·7; out-door, 91·0; total, 81·4.

It will be observed that the decrease has been mainly in the numbers of aged persons in receipt of out-door relief. Compared with the figures for 1906 the returns for 1913 show decreases in England of 147,226 or 95·2 per cent.; in Wales of 12,307 or 91 per cent.; and in England and Wales of 159,533 or 94·9 per cent. In none of the union counties in England was the decrease less than 91·4 per cent., while in Cumberland and Rutland it exceeded 99 per cent. In Wales the decrease ranged from 87·5 per cent. in Carnarvon to 96·2 in Flint. An examination of the tables in the second portion of the Paper shows that the reduction noted was evenly spread throughout the country. It will be seen that in the majority of the unions the reduction in the number of aged persons in receipt of out-door relief was more than 90 per cent.; in some 90 unions, mainly of a rural character, there were actually no persons over 70 in receipt of out-door relief on January 4, 1913. The change as regards aged persons in receipt of in-door relief has not been so marked, but the figures for January, 1913, show a reduction on those of March, 1906, of 11,909 or 20 per cent. in the case of England; 262 or 13·7 per cent. in the case of Wales; and 12,171 or 19·8 per cent. in the case of England and Wales.

The *Transactions of the Manchester Statistical Society* for the Session 1912-13 contains a number of interesting Papers and a notable address by Sir Edward Holden on the position of this country in regard to its gold reserves, in the course of which he advocated a gold currency for India. Mr. C. J. Stewart, the Public Trustee, contributes a Paper on the work of his Department. Charts and tabular matter appear to be increasingly employed by the Society, and two articles—"The Economic Value of the Ship Canal to Man-"chester and District" by J. S. McConechy and "The Physique of "the Modern Boy" by Dr. A. A. Mumford—are amply illustrated in this way. Mr. McConechy concludes that the community has benefited to a degree not generally or popularly realized, and states that "when Manchester gets a fair portion of the trade of "which she has only touched the fringe at present, those who have "sacrificed so much in the inception and construction of the canal "will be enjoying more directly than at present some measure of "the prosperity that it has brought to Manchester and the district." Dr. Mumford, who is the Medical Officer of Health of the Manchester Grammar School, in the course of his inquiry examines statistics of the Grammar School and of other schools, as well as of factories employing children, and finds indications that the bodily growth of children is less interfered with by a diseased condition than was formerly the case, and also that a smaller proportion of children have their physique impaired in other directions than in bodily growth than was formerly the case. In other Papers Mr. H. Mellor discusses the growth of a broader basis of cash reserves in English banks, and in particular of a system of cash reserves in the English joint-stock banks; and Mr. W. S. Ascoli, F.R.G.S., describes his travels and experiences in Guatemala. The latter paper is interesting, but the interest is hardly statistical, even incidentally.

The *Transactions of the Liverpool Economic and Statistical Society* for the Session 1912-13 contain three Papers given in the course of the Session, viz., "Social Statistics of Netherfield Municipal Ward "(Liverpool)," by Mr. G. F. D'Aeth; "The Housing Problem," by

Mr. C. A. Sherlock; and "The Problem of Federal Finance," by Mr. Edgar Crammond. In a Preface attention is directed to two other meetings of the Society, one devoted to a discussion on "Railway Nationalisation," and the other to an Address by the President, Professor Gonner, on "The Relation between Prices and "Wages." It is stated that the meetings of the Session have been held in the centre of the city, not as before at the University, with the result that there has been a better attendance, and the Papers have been followed by useful discussions.

A Paper by Dr. Frederick L. Hoffman on "The Decline in the "Tuberculosis Death-Rate, 1871-1912," read at the ninth annual meeting of the National Association for the Study and Prevention of Tuberculosis, in the United States, has been issued in pamphlet form. After a word of warning against fallacious calculations which have appeared in a reputable medical journal of wide circulation and which have thus obtained considerable prominence in the press, Dr. Hoffman proceeds to set forth the results of a close inquiry into the entire subject of tuberculosis statistics. It is claimed that all the evidence obtainable from trustworthy sources confirms the conclusion that the reduction in the tuberculosis death-rate in the United States during the last forty years has not been less, but in many cases much more, than in other civilised countries throughout the world. A comparison is made with the reduction in the tuberculosis death-rate in England and Wales, where, it is stated, the problem has been much less difficult than in the United States. During the decade ending with 1880 the death-rate from tuberculosis of the lungs was 206 per 100,000 of poplation for England and Wales, and this had been reduced to an average of 116 for the decade ending with 1910. There was, therefore, an actual reduction of 90 per 100,000 of population, or a reduction of 43·7 per cent. The corresponding fall in the death-rate from tuberculosis of the lungs in the three New England States for which the information is most complete, and where the industrial and economic conditions are approximately similar to those of England and Wales, was from 291 per 100,000 of population during the decade ending with 1881, to an average rate of 146 during the decade ending with 1911. There was therefore an actual reduction in the rate of 145, and a relative reduction of 49·8 per cent.

The *Geographical Journal* for August and September contains a Paper by Dr. J. F. Newstead on "Statistical Study of Wheat "Cultivation and Trade, 1881-1910" which aims at presenting in a convenient form all the available statistics relating to the quantities of wheat produced, imported, or exported and consumed in the various countries. The Paper is fully illustrated by tables and diagrams, and there is a useful summary table, which combines the statistics of acreage, yield and production and gives the totals for each continent, and also for the British Empire and the whole world. The examination made of the conditions in the separate countries leads the author to the conclusion that the acreage might be considerably extended, and he argues that a comparison of the yields per acre suggests that in many cases a higher return might be expected. Thus, as the United States already has an average yield of 14 bushels per acre there seems no reason why, with improved methods of cultivation and greater care of the soil, at least as high a return should not be obtained in European Russia, where the average is but 10 bushels. If this rise took place it would mean, on the present acreage, an increase in production of 190 million bushels, for European Russia would produce 650 million bushels, an amount equal to that obtained from the United States where the acreage is the same. A report is given of an interesting discussion which followed the reading of the Paper.

Dr. John Brownlee contributed to the July issue of the *Journal of Hygiene* a paper on the relationship between "corrected" death-rates (standardised death-rates as they are to be termed in future in the Reports of the Registrar-General) and life-table death-rates. Using twelve life-tables for England and Wales, the Healthy Districts, Brighton, Manchester, London, Scotland and Glasgow, Dr. Brownlee finds that the "corrected" death-rate is very highly correlated with the "life-table death-rate," *i.e.*, the death-rate, given by the reciprocal of the expectation of life, that would exist in a stable population. The relationship is so close that the regression equation may be used for estimating the latter from the former with an error rarely exceeding 1 per cent. Further, the relation holds not only for death-rates for all ages from birth onwards, but also for all ages from any given age upwards, so that to obtain, to a high degree of approximation, the expectation of life at any age, it suffices to know the "corrected" death-rate for all persons above that age.

A memoir on the correlation of fertility with social value, by Miss Elderton, Miss Barrington, Miss Jones, Miss Lamotte, Mr. Laski and Professor Karl Pearson, has recently been issued by the Eugenics Laboratory (Dulau and Co., 6*s.* net). The memoir is based on data respecting the working classes from Blackburn, Preston, Glasgow and Birmingham and data respecting the families of imbeciles from the Royal Albert Asylum, Lancaster, material being selected from this for those families only with weekly incomes of 3*l*. or under so as to render it more comparable with that available from other sources. The memoir discusses in great detail the relation between size of family and such factors as wage or income, rent paid and parents' age (father's or mother's according as the one or the other was available from the record used). The general conclusions of the memoir on the main point are in accord with those reached by others, *e.g.*, by Mr. Stewart Johnson in his note on the relation between large families, poverty, irregularity of earnings and crowding in the JOURNAL for 1911-12. The number of children shows either no appreciable positive relation or a quite appreciable negative relation with wages, and with other indications of higher "social value." A number of interesting subsidiary points are also dealt with, *e.g.*, the relation between wage and age: wage is shown to increase but very little with age up to the maximum at 40 to 50, after which it slowly drops.

The Board of Agriculture issued, in August last, as a Supplement to their Journal (No. 11), a report by Mr. H. D. Vigor on the correlation between the percentage of milk fat and the quantity of milk produced by Ayrshire cows. The data analysed were published in the Report of the Ayrshire Cattle Milk Records Committee for 1909, and showed for each cow dealt with, so far as the data were available, the total milk yielded, the average percentage of milk fat found at periodical tests, the duration of lactation, the age of the cow, the date of last calving, and the date of going dry. Mr. Vigor has evaluated the correlations between (1) percentage of milk fat, (2) average weekly yield of milk, (3) duration of lactation and (4) age of cow. Basing the conclusions on the partial coefficients, it is found that the milk of cows giving the larger average weekly yields shows an appreciable tendency to be poorer in milk fat, as also does the milk of the older cows, but there is no appreciable relation between percentage of milk fat and duration of lactation. The regression coefficient of percentage of milk fat on average weekly yield (in gallons) allowing for duration of lactation and age, is $-0{\cdot}222$: that is to say, an increase of 1 gallon in the weekly yield will probably mean a reduction of $0{\cdot}222$ in the percentage of fat and so on proportionately. Mr. Vigor, differing on this point from some other workers, finds no appreciable relation between time of calving and quantity or quality of yield.

In the majority of countries where registration is in force the tabulation of the distribution of births in each month of the year is a regular item in the official statistics, and a considerable amount of attention is given to the variations to be noted in the recorded figures. In such monthly analysis any delay in registration, whether deliberate or accidental, is liable to give rise to various explanatory theories for which no real basis exists. As early as 1896 Benini called attention to the notable difference in the proportions of male births registered in Italy during the months of December and January, and urged the Government statisticians to initiate an inquiry as to the causes of such difference. Apparently no official inquiry was made, and the work has at last been undertaken by Corridore, who has published the results obtained in an essay entitled "Denunzie Ritardate di Nascite in Italia e Altri Stati." His inquiry covers a period of forty-seven years (1863-1909, but data for 1891-94 are wanting). He finds that in the ten years 1863-72 the ratio in the whole Kingdom of male births to female (100) was 107·7 during January as compared with 105·6 in December, the corresponding figures for the seven years 1903-09 being 110·8 and 99·3 respectively. He has examined the figures for each individual province and for the more important cities of the Kingdom. The disparity in the ratios for the two months is generally greater in the southern parts of the Kingdom than in the northern. The phenomenon is not observed in Sardinia at all. It is more marked in the case of legitimate than in that of illegitimate, and is only occasionally to be noted with respect to still-births. An analysis of the daily mean number of the births of females in each month of the year during the period 1896-1908 shows that there is some increase in the number of such births recorded in January as compared with the number for the preceding December, but the difference is nothing like so great as that observed in the case of males. As a rule infantile mortality during the first month of life is greater in December than in January. His inquiry was extended to cover all countries furnishing monthly data (not published in this country) and he finds that the same phenomenon, to a greater or less measure, is to be observed in nearly every country. Various theories have been put forward in explanation of the difference in the ratio of males in the two months—which is evidently more than a local peculiarity. Among such explanations are—difficulty of attending at the registration office owing to inclement weather; a desire to postpone for a year the time of entering the army through conscription, in the case of males, or of being able to take a year off the age, in the case of females—none of which appear to be satisfactory. The author has no definite explanation to offer and concludes with an expression of opinion that the problem is one of such general extension and sufficient interest to be worthy of examination by official statisticians.

It is announced by the Royal Agricultural Society that the Committee of the Rothamsted Experimental Station propose to celebrate the centenary of the birth of Sir John Lawes and Sir Henry Gilbert by rebuilding the Laboratory which was presented to Sir John (then Mr.) Lawes in 1855, but which does not now satisfy modern requirements. The sum of 12,000*l.* is required to erect and equip a suitable laboratory, but it is understood that if half this sum is raised by public subscription the remainder can be obtained as a grant. An appeal is therefore being made for 6,000*l.* More than half of this has already been collected, and the Rothamsted Committee are anxious to receive the remainder as soon as possible and to put the buildings in hand at an early date. Donations should be sent to Dr. E. J. Russell, Rothamsted Experimental Station, Harpenden, Herts, or to the Secretary, Royal Agricultural Society, at 16, Bedford Square, London, W.C.

The subject of the Newmarch Lectures on Statistics at the University of London, Session 1913-14, is "The National Output, "as shown by the First Census of Production." The course consists of six lectures, delivered on Mondays at 5.30 p.m., beginning November 3, in the course of which the lecturer, Mr. A. W. Flux, deals with the scope of the first Census of Production in the United Kingdom and the aggregate value of the output of our industries, as well as the contribution to the aggregate of the principal groups of industries. Other heads of discussion are:—Relation of output to numbers employed in the several industries. What, as a nation, we make, what we buy, and what we sell. Relative importance of our national consumption of food, clothing, &c.: extent of our annual savings. Comparison with other countries, and in particular with the United States.

At the last annual meeting of the National Council for the Promotion of Public Morals, held in October, a commission was appointed to inquire into the social, economic and racial significance of the falling birth-rate and to suggest remedies. The commission consists of a number of leading Ministers, doctors, biologists, sociologists and social workers, including Dr. T. H. Stevenson, the Superintendent of Statistics for the Registrar-General, and Dr. A. Newsholme, Chief Medical Officer of the Local Government Board, with Bishop Boyd Carpenter as President. A report of the evidence presented to the Commission and its findings will be published.

The first number has been issued of the *Indian Journal of Medical Research*, which will in future be the official organ of the Indian

Research Fund Association and will take the place of *Paludism* and the *Scientific Memoirs*. The journal, which will be published quarterly, is edited by the Director-General of the Indian Medical Service and the Sanitary Commissioner with the Government of India, in collaboration with a council of distinguished advisers.

Sir Alfred E. Bateman, K.C.M.G., has been elected an Honorary Member, and Mr. G. H. Knibbs, C.M.G., and Dr. T. H. Stevenson Ordinary Members of the International Statistical Institute.

The resignation is announced of M. Anders N. Kiær, who has been director of the Central Statistical Bureau of Norway since 1867. He is succeeded by M. N. Rygg, Professor of Political Economy and Statistics at the University of Christiania. M. Kiær has been an honorary Fellow of the Royal Statistical Society since 1874.

M. Adolph Jensen has been appointed head of the Statistical Department of Denmark in succession to M. Michael Koefoed, who has become Director-General of Customs and Taxation.

The death took place on December 5 of Mr. E. Johnstone, who for about a quarter of a century was editor of the *Economist*. He relinquished his duties in 1907, owing to ill-health. His connection with the Press began in Edinburgh in 1866 when he entered the *Scotsman* office at the age of 22. After eight years in Edinburgh, he was appointed in 1874 to an important position in the London office of the *Scotsman* where he remained till 1881, when, at the invitation of Mr. Walter Bagehot, he took up the conduct of the *Economist*. He was a Fellow of this Society from 1878 to 1908.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Accountants Magazine. August, 1913—Income tax, with special reference to recent legislation: *Allan (John)*. Profit-sharing and labour co-partnership: *Low (James A.)*.

Bankers' Magazine, 1913—

August—Recent gold coinages of the world. Growth of leading savings banks: *Gibson (A. H.)*.

September—The gold reserve problem (*continued in next issue, October*, 1913).

October—Is there a case for railway nationalisation? The financial and economic position in Japan.

Economic Journal. September, 1913—A successful social reformer, Ernst Abbe: *Glatzer (J.)*. Finance of railway nationalisation in Great Britain: *Lehfeldt (R. A.)*. Price variations in New Zealand: *McIlraith (J. W.)*. The feeding and medical treatment of school children: *Carr-Saunders (A. M.)*. The incidence of national insurance contributions: *Cunnison (James)*.

Economic Review, 1913—

July—Famine relief in India: *Barker (D. A.)*.

October—On some fundamental notions of economics: *Smith (J. A.)*. The ownership of capital: *Browne (Sir Benjamin C.)*. The census of production and labour propaganda: *Pringle (Rev. J. C.)*. Old age pensions: *Rogers (Rev. C. F.)*. Economic conditions in North-West Canada: *Michell (Humfrey)*.

Eugenics Review, 1913—

July—The effect of economic conditions on the birth-rate: *Marshall (W. C.)*. French Commission on depopulation: *Onslow (Hon. H.)*.

October—Depopulation and eugenics. Part 1: *March (Lucien)*.

Financial Review of Reviews—

August, 1913—The Development of Egypt: *Macara (Sir Charles W.)*.

September, 1913—The changing character of British trade: *Wright (Arnold)*.

October, 1913—Australia's financial position: *Stead (Henry)*.

November, 1913—The cost of living and investments: *Wright (Arnold)*.

Journal of the East India Association. July, 1913—The relation of the currency to the social and economic progress of India: *Major (Mark B. F.)*.

Journal of the Institute of Actuaries. October, 1913—National Insurance Act, 1911: New life tables.

UNITED KINGDOM—*Contd.*

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Manchester Statistical Society. Transactions. Session 1912-13—The economic value of the ship canal to Manchester and district: *McConechy (J. S.).* The physique of the modern boy: *Mumford (A. A.).* The question of cash reserves in the English banks: *Mellor (Harold).* The work of the public trustee: *Stewart (C. J.).* Guatemala—Travels and experiences: *Ascoli (W. S.).*

United Empire. (Royal Colonial Institute Journal), 1913—

July—The German Colonies in 1911-12: *Hamilton (Louis).*

August—Cereal growing in Argentina: *Holder (S.).*

September—The Plumage Bill in relation to the British Empire: *Buckland (James).* The organisation and aims of the Hamburg Colonial Institute: *Keutgen (F.).* The oil resources of the Empire: *Grice (J. Watson.)*

October—Central America and the Panama Canal.

UNITED STATES—

American Economic Review. September, 1913—A classification of pools and associations based on American experience: *Stevens (W. S.).* Possible complications of the compensated dollar: *Clark (J. M.).* Monopoly and competitive prices: *Agger (Eugene E.).* Farm credit in a Northwestern State: *Jacobstein (Meyer).* The definition of economics: *Hawley (Frederick B.).* The impatience theory of interest: *Fisher (Irving)* and *Seager (H. R.).*

American Journal of Sociology. September, 1913—The sphere of pecuniary valuation: *Cooley (C. H.).* The Italian triple alliance of labor: *Borosini (Victor von).*

American Statistical Association (Quarterly Publications). No. 102. *June*, 1913—International statistics of the consumption of alcohol: *Milliet (E. W.).* Benevolent hospitals in Metropolitan Boston: *Mahoney (W. H.).* Street accidents—New York city: *Clowes (E. S.).* Occupational mortality and causes of death: *Bertillon (Jacques).* "Gresham's Law" as applied to immigration to Hawaii: *Clark (Victor S.).*

Journal of Political Economy

July, 1913—The thirteenth census: *Willis (H. Parker).* Systematised and scientific management: *Kendall (H. P.).* Units, methods, and devices of measurement under scientific management: *Gilbreth (Frank B.).* The relation of scientific management to the wage problem: *Thompson (E. Bertrand).*

October, 1913—Money and prices: *Magee (James D.).* An analysis of the crisis cycle: *England (Minnie T.).* The recent history of immigration and immigration restriction: *Hall (Prescott F.).* The Ontario workmen's compensation bill: *Weaver (S. Roy).*

Political Science Quarterly. September, 1913—Syndicalism in America: *Levine (Louis).*

EGYPT—

L'Egypte Contemporaine. May, 1913—Le bien de famille et la loi égyptienne sur l'insaisissabilité des cinq feddans: *Blanchard (G.)*. La guerre et les finances: *Hoselitz (R.)*. Note sur les syndicats-coopératives agricoles fonctionnant en Égypte: *Michel (B.)*. Le commerce extérieur de l'Egypte pendant l'année 1912: *Levi (I. G.)*.

FRANCE—

Bulletin de la Statistique générale de la France. October, 1913—Contribution à la statistique des fonctionnaires: *March (Lucien)*. Durée des mariages. Table d'extinction et de durée des mariages pour la population de la France: *Huber (Michel)*.

Journal des Économistes, 1913—

July—Le census des États-Unis: *Guyot (Yves)*. Les comptes des chemins de fer fédéraux en 1912: *Favarger (Ph)*. Etat d'esprit syndicaliste: *Garcin (F.)*. Les organisations de défense patronale: *Nouvion (Georges de)*. La crise sardinière et la récente sentence arbitrale: *Gounault (E.)*. Rapport au Sénat sur le budget des postes et télégraphes: *Macler (M.)*. Résultats des assurances sociales en Allemagne: *Mondet (N.)*.

August—Définition, caractère et indices des crises: *Guyot (Yves)*. La première session de la Commission financière balkanique: *Máptup*. Le système monétaire de l'Argentine et les organes de la circulation: *Lafond (Georges)*. Les fausses indications d'origine: *Fernand-Jacq*. Les premiers résultats de la nouvelle loi anglaise d'assurance sociale: *Bellom (Maurice)*.

September—La situation économique des Pays-Bas: *Guyot (Yves)*. La marine marchande grecque (*continued in next issue, October*, 1913): *Andréadès (A.)*. La Serbie au lendemain de la guerre: *Muzet (Alphonse)*. Orthodoxie mutualiste: *Nouvion (Georges de)*. Les premiers résultats de la nouvelle loi anglaise d'assurance sociale: *Bellom (Maurice)*.

October—Du placement des capitaux: *Guyot (Yves)*. M. Emile Levasseur et l'économie politique au Conservatoire des arts et métiers: *Deschamps (Auguste)*. La XIVe session de l'Institut international de statistique: *Schelle (G.)*. Le canal de Panama payera-t-il? *Bellet (Daniel)*. Les finances des villes au début du XXe siècle: *Léris (Pierre)*.

Journal de la Société de Statistique de Paris, 1913—

July—Les statistiques de la production industrielle, en particulier le Census de la production du Royaume-Uni en 1907: *Huber (Michel)*. Le Census of production, et le revenu du Royaume-Uni: *Guyot (Yves)*. Note sur le développement de la production et des transports par voie ferrée des industries minières et métallurgiques: *Bernard (J.)*.

August-September—Les émissions et remboursements d'obligations des six grandes compagnies de chemins de fer en 1912: *Neymarck (A.)*. Le livre foncier de Paris 1911:

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Journal de la Société de Statistique de Paris, 1913—

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Meuriot (Paul). Statistique internationale de l'invalidité: *Fuster (Ed.).* L'enquête sur l'industrie du verre et sur l'industrie du papier en Finlande: *Pissargersky (Mlle. Lydie de).* Les salaires féminins dans l'industrie de la fleur artificielle en France et de la dentelle en Belgique: *Pissargersky (Mlle. Lydie de).*

October—Les "classiques" et les "techniciens" dans leurs notes d'examens à la Faculté des sciences: *Niceforo (M.).* Le Reichstag impérial de 1871 à 1912: *Meuriot (Paul).*

La Réforme Sociale, 1913—

July 1–16—L'organisation de la bienfaisance privée aux Etats-Unis.—La question du pécule obligatoire.—Le régime des "charities" en Angleterre.

August 1–16—L'organisation de la bienfaisance privée et le contrôle des établissements libres: *Witt-Guizot (Francois de).* Le pécule-salaire dans les établissements de bienfaisance privée: *Prevost (Eugène).* Le salaire minimum des ouvrières à domicile: *Isaac (Auguste).* Le problème de la misère: *Rivière (Louis).*

September 1–16—Le salaire minimum des ouvrières à domicile: *Issaac (Auguste).*

October 16—L'état présent de la bienfaisance privée à Paris: *Plantet (Eugène).* Les prêts sur l'honneur: *Clément (Henry).*

November 1—Les conditions d'existence du jeune salarié agricole en France: *Meny (Georges).*

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July–August—La hausse actuelle de la monnaie, du crédit et des prix. Comment y remédier: *Fisher (Irving).* Comment expliquer les mouvements de la population humaine (*continued in next issue, September–October*): *Turgeon (Charles).* La régime douanier colonial: *Bernard (François).* Graphiques relatifs a la hausse de l'intérêt: *Rist (Charles).* La co-opération agricole chez les Yongo-Slaves d'Autriche: *Gonnard (René).* Chronique des transports et travaux publics: La lutte de la voie ferrée et de la voie d'eau: *Porte (Marcel).*

September–October — Art technique et économie politique: *Schwiedland (E.).* Le bassin de Briey et la politique de ses entreprises sidérurgiques ou minières: *Vignes (Maurice).* Les causes démographiques de l'expansionisme colonial italien: *Michels (Roberto).* Quelle est la part de la classe ouvrière dans les dépôts des caisses d'épargne: *Chatelain (E.).* De l'exploitation usuraire de l'acheteur par la vente à tempérament: *Dijol (Marcel).*

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GERMANY—

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July—Die Elemente des Wirtschaftslebens: *Sombart (Werner).* Die logische Struktur des historischen Materialismus: *Altschul (Dr. S. E.).* Landwirtschaft—Landindustrie—Aktiengesellschaft. Eine Untersuchung über die Zukunft des landwirtschaftlichen Grossbetriebs: *Leonhard (Dr. R.).* Die Kinderarbeit in Oesterreich: *Schiff (Prof. Walter).* Die soziale Geschichte der Schultheiss-Brauerei. Eine Studie: *Lenz (Prof. Fr.).* Der "Allgemeine Jüdische Arbeiterbund" zur Zeit der russischen Revolution (1904-07). Angestelltenorganisationen und Sozialpolitik.

September—Die Bureaukratisierung und die gelbe Arbeiterbewegung: *Weber (Alfred).* Zur Geschichte der Berufsidee: *Salz (Dr. Arthur).* Der Syndikalismus in England: *[illegible] (C. K.).* Die Kinderarbeit in Oesterreich: *Schiff (Prof. Walter).* Zur Psychologie der sog. Rentenhysterie: *[illegible] (Dr. Max).* Ein Beitrag zu den Problemen der Unfallneurose: *[illegible] (Dr. A.).* Die allgemeine Teuerung im Lichte der Nationalökonomie: *Mises (Dr. Ludwig von).* Bewegung der öffentlichen Beamten und Beamtensozialpolitik.

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Heft 3—Die Hetze von Alexander Tille und Konsorten gegen Lujo Brentano: *Schmoller (Gustav).* Die sozialwissenschaftliche Grundlage und Struktur der Malthusianischen Bevölkerungslehre: *Kohler (Walther).* Die Vorgeschichte des Finanzsystems von John Law: *Mann (Fritz Karl).* Zur Finanzgeschichte des Ruhrkohlen-Bergbaues: *Schacht (Hjalmar).* Die britische Kleinjustiz in Zivilsachen und ihre Lehren für Deutschland: *Sigsfeld (C. Bartsch).* Zur Frage des Anerbenrechts in Württemberg: *Elsas (Fritz).* Der deutsche Zolltarif von 1902: *Hollander (Julius Walter).* Russisch-Turkestan und die Tendenzen der heutigen russischen Kolonial-politik: *Hoetzsch (Otto).* Die Entlöhnungsmethoden in der deutschen Metallindustrie: *Heiss (Clemens).* Die Wertzuwachssteuer in Literatur und Gesetzgebung: *Gerloff (Wilhelm).*

Heft 4—Die Einheitlichkeit des statistischen Denkens: *Seutemann (Karl).* Zum Rechte der gewerblichen Genehmigungen: *Gerland (Otto).* Die Emissionstatistik in Deutschland und einigen ausländischen Staaten: *Marx (Martin).* Die Noten der Niederländischen Bank. Ein Beitrag zur Frage der Ausgabe kleiner Noten: *Eisfeld (Curt).* Zur

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October, 1913—Privatwirtschaftslehre, Volkswirtschaftslehre, Weltwirtschaftslehre: *Diehl (Karl)*. Zwangsinnungen und Mindestpreise: *Schmidt (Erhard)*. Das Bankproblem im Lichte der kurzfristigen Depositen: *Heinemann (Ernst)*.

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ITALY—

Giornale degli Economisti e Rivista di Statistica—

July, 1913—Numeri indici dello stato e del progresso economico delle regioni italiane: *Mortara* (*Giorgio*). Considerazioni in difesa del giuoco d'azzardo legalmente disciplinato: *Martello* (*Tullio*).

August, 1913—Che cosa è il reddito: *Ricci* (*Umberto*). Il monopolio commerciale del petrolio in Germania: *Massuero* (*F. Nobili*).

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La Riforma Sociale—

June-July, 1913—Il problema della popolazione in Italia: Perchè la natalità declina più rapida in Piemonte e Liguria: *Necco* (*Achille*). La nuova tariffa doganale americana: *Caroncini* (*Alberto*). Sulla libera docenza in Italia ed in Germania: *Michels* (*Roberto*). Verso la crisi economica mondiale? Il momento presente dell' economia italiana dopo quattro anni di ristagno: *Einaudi* (*Luigi*).

August-September, 1913—La "tutela dei risparmi" e gli emendamenti della giunta generale del bilancio: *Geisser* (*Alberto*). La questione del cambio: *Del Vecchio* (*Gustavo*). Il controllo dei servizi pubblici e le "public service commissions" americane: *Norsa* (*Renzo*). I prezzi delle merci in Italia nel 1911: *Necco* (*Achille*). La nostra contabilità di stato ed un "Referendum": A proposito di casi recenti: *Vianello* (*Vincenzo*).

October-November, 1913—Il Canale di Panama: *Geisser* (*Andrea*). Di una nuova proposta per rendere più stabile il valore della moneta: *Graziani* (*Augusto*). La produzione solfifera siciliana con speciale riguardo al consorzio obbligatorio vigente: *Vinci* (*Felice*). La valorizzazione del caffè nel Brasile: *De' Paoli* (*Elmo*). Ancora l' imposta di ricchezza mobile ed i nostri parlamentari.

Rivista Italiana di Sociologia. *May-August*, 1913—La fecondità in rapporto alla distanza dei parti: *Drago* (*M.*).

LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since July 8, 1913, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Austria—

Denkschrift der k.k. Statistischen Zentral-Kommission zur Feier ihres Fünfzig-jährigen Bestandes. La. 8vo. 1913. (The Central Statistical Commission.)

Résumé rétrospectif de la statistique de l'Autriche. xxix + 99 pp., 8vo. 1913. (*Id.*)

Die Ergebnisse der Volkszählung vom 31 Dezember, 1910. Heft 2, des Zweiten Bandes. Die Ausländer. Fol. 1913. (*Id.*)

Justice. Tafelwerk zur Österreichischen Justiz-Statistik. Ein Quellenwerk für Justizstatistische Forschungen. Jahrgang i, 1910. Fol. 1913. (*Id.*)

Labour. Erhebung über die Kinderarbeit in Österreich im Jahre 1908. Teil 2. Textliche Darstellung. Heft 2. Fol. 1913. (The Austrian Labour Department.)

—— Bleivergiftungen in Huttenmannischen und Gewerblichen Betrieben. Ursachen und Bekampfung. Teil 8. Bericht uber die Erhebungen in der Keramischen, Glas, und Emailindustrie. 4to. 1913. (*Id.*)

——Verhandlungen des standigen Arbeitsbeirates uber den Entwurf eines Gesetzes, betreffend de Regelung der Arbeitsverhältnisse in der Heimarbeit. 8vo. 1913. (*Id.*)

Bohemia. Statistiches Handbuch des Konigreiches Bohmen. 11. Ausgabe. 8vo. 1913. (The Statistical Bureau.)

Vienna. Bericht des Wiener Stadtphysikates uber seine Antstatigkeit und uber die Gesundheitsverhaltnisse, 1907–10. 8vo. 1913. (The Health Department.)

Belgium—

Exposé de la Situation du Royaume de 1876 à 1900. IIme Fascicule. 8vo. 1913. (The Ministry of the Interior.)

Census. Recensement Général du 31 Décembre, 1910. Tome 3. Fol. 1913. (*Id.*)

Denmark—

Précis de Statistique. 1913. 71 pp., 8vo. 1913. (The State Statistical Bureau.)

Danmarks Civile og Kriminelle Retspleje. 1906-10. 4to. 1913. (*Id.*)

France—

Agriculture. Statistique Agricole. Tableau Rétrospectifs. 8vo. 1913. (The Ministry of Agriculture.)

—— Culture, Production, et Commerce du Blé dans le Monde. 4to. 1912. (*Id.*)

Labour. Conseil Supérieur du Travail. 22e Session Novembre, 1912. Compte-Rendu. 4to. 1913. (Ministry of Public Works.)

Paris. Recueil de Statistique Municipale. 1913. De la mortalité et des causes de mort par profession (Suite et fin.) 8vo. 1913. (Dr. J. Bertillon.

Germany—

Das Arbeitsgebiet des Kaiserlichen Statistischen Amtes nach dem Stande des Jahres 1912. 4to. 1913. (The Imperial Statistical Bureau.)

Labour. Beiträge zur Arbeiterstatistik. Nr. 12. Gebiete und Methoden der Amtlichen Arbeitsstatistik in den wichtigsten Industriestaaten. vii + 695 pp. 8vo. 1913. (*Id.*)

(a) **Foreign Countries**—*Contd.*

Germany—*Contd.*

Berlin. Ergebnisse der bisherigen Versuche kommunaler Fleischversorgung in den grösseren deutschen Städten. 43 pp., sm. 8vo. 1913. (The Municipal Statistical Bureau.)

Dusseldorf. Taschenbuch des Statistischen Amts der Stadt Dusseldorf. 1913. Funfte vermehrte Auflage. 130 pp., sm. 8vo. 1913. (*Id.*)

Nürnberg. Graphisch- Statistischer Atlas der Stadt Nürnberg. La. 8vo. 1913. (*Id.*)

Verein für Sozialpolitik.

Die Landwirtschaftlichen Produktionsverhältnisse Argentiniens. Von. Dr. E. Pfannenschmidt. 89 pp., 8vo. 1913. (Purchased.)

Die Ansiedelung von Europäern in den Tropen. Teil 3. Abgeordneter Maurice G. Evans, Dr. Hardy und Dr. Karstedt. Natal, Rhodesien, Britisch-Ostafrika. 162 pp., 8vo. 1913. (*Id.*)

Untersuchungen uber das Versicherungswesen in Deutschland. 362 pp., 8vo. 1913. (*Id.*)

Untersuchungen über das Volkssparwesen. Bände 2, 3 and 4. 3 vols., 8vo. 1913. (*Id.*)

Hungary—

Assurance sociale en Hongrie. Opérations de la Caisse nationale d'Assurance-Maladie et Accidents pendant 1907 à 1909. 137 pp., 8vo. 1913. (The Royal Hungarian Insurance Office.)

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Italy—

Annali di Statistica, Series 5. Vol. 5. Atti del Consiglio superiore di Statistica, Sessione febbraio. 1913. 8vo. 1913. (The Ministry of Agriculture.)

—— Series 5. Vol. 6. Ferraris (Carlo F.) Statistiche delle Universita e degli Istituti superiori. 8vo. 1913. (*Id.*)

Census. Censimento degli Opifici e delle Imprese Industriali al 10 giugno 1911. Vol. 1. Dati riassuntivi concernenti il numero, il personale e la forza motrice delle imprese censite. (Tav. 1.) Fol. 1913. (The Director of the Census.)

Justice. Atti della Commissione di statistica e Legislazione. Relazioni e verbali delle discussioni della sessione del Febbraio 1912. 8vo. 1912. (The Ministry of Justice.)

—— Statistica della Criminalita per 1908. Notizie Complementari alla statistica Giudiziaria Penale. Fol. 1913. (*Id.*)

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Japan—

Décès par maladies épidémiques aiguës. (1899-1908) (Tableaux). 4to. 1913. (Bureau of General Statistics.)

Chosen (*Korea*). Annual Report on Reforms and Progress in Chosen (Korea). (1911-12). 8vo. Keijo, 1912. (The Government General of Chosen).

Taiwan (*Formosa*). The Statistical Summary of Taiwan. 8vo. Tokyo, 1912. (The Civil Governor of Formosa.)

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Census. Division Territorial de los Estados Unidos Mexicanos. 3 vols., 8vo. 1913. (Director-General of Statistics.)

Labour. Boletin del Departamento del Trabajo. Ano 1. Num. 2. August, 1913. 8vo. 1913. (The Department.)

Netherlands—

Census, 1909. Introduction des resultats du 9e recensement général et du dénombrement des demeures habitées et des professions. 4to. 1913. (The Central Statistical Bureau.)

—— Résultats du dénombrement de professions, 1909. 5 vols., 4to. 1913. (*Id.*)

—— Supplement. Densité de la population des communes, provinces et Royaume. 4to. 1913. (*Id.*)

—— Supplement. Tables de Mortalité déduites des données de la période 1900-09 par Dr. A. J. Van Pesch. xvi + 43 pp., 4to. 1912. (*Id.*)

Elections. Kiezersstatistiek benevans aanvulling der Verkiezingsstatistiek in 1913. 8vo. 1913. (*Id.*)

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Alcohol. Statistique des boissons alcooliques: Consommation de l'eau de vie, du vin et de la bière en Norvège, 1908-1911. 8vo. 1913. (*Id.*)

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Russia—

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Spain—

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Sweden—

Emigration. Emigrationsutredningen. Betänkande i Utvandringsfrågan och Darmed Sammanhangande Sporsmal . . . afgifvet af Gustav Sundbärg. xii + 892 pp., 8vo. 1913. (The Author.)

Switzerland—

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United States

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—— Vol. 8. Manufactures, 1909. General Report and Analysis. 4to. 1913. (*Id.*)

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—— 114. Wholesale Prices 1890 to 1912. 8vo. 1913. (*Id.*)

—— 115. Retail Prices 1890 to February, 1913. 8vo. 1913. (*Id.*)

—— 116. Hours, Earnings, and Duration of Employment of Wage-Earning Women in selected Industries in District of Columbia. 8vo. 1913. (*Id.*)

—— 119. Working Hours of Women in Pea Canneries of Wisconsin. 8vo. 1913. (*Id.*)

—— 120. Hygiene of Painters' Trade. 8vo. 1913. (*Id.*)

—— 121. Sugar Prices, from Refiner to Consumer. 8vo. 1913. (*Id.*)

—— 122. Employment of Women in Power Laundries in Milwaukee, &c. 8vo. 1913. (*Id.*)

—— 123. Employers' Welfare Work. 8vo. 1913. (*Id.*)

—— 124. Conciliation and Arbitration in Building Trades of Greater New York. 8vo. 1913. (*Id.*)

—— 125. Retail Prices 1890 to April, 1913. 8vo. 1913. (*Id.*)

—— 128. Wages and Hours of Labour in Cotton, Woolen, and Silk industries. 1890 to 1912. 8vo. 1913. (*Id.*)

—— 129. Wages and Hours of Labor in Lumber Millwork and Furniture Industries 1890 to 1912. 8vo. 1913. (*Id.*)

—— 131. Union scale of Wages and Hours of Labor, 1907 to 1912. 8vo. 1913. (*Id.*)

—— 132. Retail Prices 1890, to June, 1913. 8vo. 1913. (*Id.*)

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4. A first Study of Inheritance in Epilepsy. By *C. B. Davenport* and *David F. Weeks.* 30 pp., 8vo. 1911. (*Id.*)

5. A Study of Heredity of Insanity in the Light of the Mendelian Theory. By *A. J. Rosanoff* and *Florence I. Orr.* 40 pp., 8vo. 1911. (*Id.*)

6. The Trait Book. By *C. B. Davenport.* 52 pp., 8vo. 1912. (*Id.*)

7. The Family History Book compiled by *Charles B. Davenport*, &c. 101 pp., 8vo. 1912. (*Id.*)

8. Some Problems in the Study of Heredity in Mental Diseases. By *Henry A. Cotton*, M.D. 59 pp., 8vo. 1912. (*Id.*)

9. State Laws limiting Marriage selection examined in the light of Eugenics. By *Charles B. Davenport.* 66 pp., 8vo. 1913. (*Id.*)

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Venezuela

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(b) **India and Colonies.**

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—— Vol. 5, Bihar and Orissa. Part 3, Tables. Fol. 1913. (*Id.*)

—— Vol. 6, City of Calcutta. Part 1, Report. Part 2, Tables. 2 vols., fol. 1913. (*Id.*)

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—— Vol. 23, Travancore. Part 1, Report. Part 2, Imperial Tables. 2 parts, fol. 1913. (*Id.*)

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Rangoon. City of Rangoon. Census Tables, No. 5. 8vo. 1913. (*Id.*)

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Appendix to Monthly Summary, June, 1913. Statistics of Small-Pox and Vaccination in Australia and other Countries. 8vo. 1913. (The Commonwealth Bureau of Census and Statistics.

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Canada, Dominion of—

Census. Fifth Census of Canada, 1911. Vol. 1. Area and Population by Provinces, Districts and Sub-districts. 8vo. 1912. (The Census Office.)

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(b) India and Colonies—*Contd.*

Canada, Dominion of—*Contd.*

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—— 8. Agriculture of Manitoba for 1910. 8vo. 1913. (*Id.*)
—— 9. Agriculture of Saskatchewan for 1910. 8vo. 1913. (*Id.*)
—— 10. Agriculture of Alberta for 1910. 8vo. 1913. (*Id.*)
—— 16. Mineral Production of Canada for 1910. 8vo. 1913. (*Id.*)
—— 17. Infirmities of the People for 1911. 8vo. 1913. (*Id.*)

Jamaica—

Census of Jamaica and its Dependencies taken April 3, 1911. Fol. 1912. (The Colonial Office.)

New Zealand—

Appendix to Report of Department of Labour, 1912. Showing (1) actual numbers employed in each trade; (2) their average duration of employment; (3) their average weekly rate of wages for a normal week (without overtime or loss of time); (4) their average weekly earnings in each trade during period of employment; and (5) their average weekly earnings in each trade throughout the year. Fol. 1913. (The Department of Labour.)

Union of South Africa—

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(c) United Kingdom and its several Divisions.

United Kingdom—

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JOURNAL
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JANUARY, 1914.

The Co-operative Insurance *of* Live-Stock *in* England *and* Wales.

By Sir James Wilson, K.C.S.I.

[Read before the Royal Statistical Society, December 16, 1913, the President, Professor F. Y. Edgeworth, M.A., F.B.A., in the Chair.]

When I was instructed some time ago to see what could be done to encourage the co-operative insurance of live-stock in England and Wales, I naturally, as became a Fellow of this Society, set to work to collect whatever statistics might be available on the subject. I found that there were in existence about a thousand co-operative societies for the insurance of pigs, about 130 for the insurance of cows, and about half a dozen for the insurance of horses. Very few of these societies are registered, and it was a work of some time and difficulty to collect information from the unregistered societies, which were not in touch with any official agency. I have now to put before you such statistics as we have been able to obtain from pig and cow societies, and shall be grateful for any criticism of the method employed and the conclusions drawn, as upon them must depend the advice which we are about to give to agricultural communities which may think of starting similar co-operative societies for the insurance of live-stock. It seemed best to begin with the question of the insurance of pigs, as the volume of statistics and experience available was much larger in the case of pigs than in the case of cows.

Existing pig insurance societies.

Returns collected by the Board of Agriculture and Fisheries show that about 4,400,000 pigs were sold off the farms of Great Britain in 1908–09 at an aggregate price of about 14,350,000*l.*, an average of about 3*l.* 5*s.* per pig; and in the month of June every year there are in the country approximately 3,000,000 pigs, which must be worth some 10,000,000*l*. Less than 2 per cent. of this valuable property is insured (except against fire), as the live-stock insurance companies do not find the insurance of pigs a profitable business, and therefore do not encourage it. In many parts of the country, however, the insurance of pigs against death from disease or accident has been successfully undertaken by small societies formed by the pig-owners themselves on co-operative principles. It has been ascertained that in England and Wales there are about a thousand of such pig insurance societies, generally known as pig clubs. Statistics are available for the 33 which are registered under the Friendly Societies Act and for 832 unregistered clubs.

Unregistered pig clubs.

In the year 1911 these 832 unregistered clubs were composed of 30,529 members and insured 53,981 pigs; thus the average number of members was 37, and the average number of pigs insured per club was 65. Of these insured pigs 2,837 died during the year, so that the average death-rate was 5·3 per cent. for that year, which was exceptionally hot and trying for fat pigs. The amount paid in claims aggregated 4,968*l*., an average of 1*l*. 15*s*. per pig that died, and of 1*s*. 10*d*. per pig insured. The total amount realised in contributions from members was 7,462*l*., an average of 2*s*. 9*d*. per pig insured, which was more than sufficient to cover the losses and the expenses of management. Thus, taken as a whole, these clubs were worked at a substantial profit during the year, and as many of them had been in existence for a considerable number of years, their total savings up to date amounted to the large sum of 27,748*l*., an average of over 33*l*. per club. The profits of each club, with the exception of a small amount kept in hand to meet current expenses, are deposited in the savings bank, and form a reserve fund which not only brings in an annual income in interest, but secures the members of the club from the risk of having to make a special levy on themselves in order to meet the exceptional mortality of any year. The amount so held in reserve was, for all the clubs put together, equal to more than five times the losses of the year, so that the great majority of these small unregistered rural pig clubs are evidently in a safe financial position and worked on sound lines.

Similar statistics have been collected for the year 1912, but only for 687 clubs, which consisted of 25,769 members and insured 43,271 pigs. Of these, 2,178 died during the year, and the societies paid on them claims amounting to 4,137*l*., while the receipts in contributions amounted to 6,325*l*. Thus the death-rate for the year was 5 per cent., the average amount paid on each pig that died was 1*l.* 18*s.*, the average cost of compensation per pig insured was 1*s.* 11*d.*, and the average realisations in contributions equalled 2*s.* 11*d.* per pig insured.

Registered pig insurance societies.

Fuller information is available for the 33 pig insurance societies which are registered under the Friendly Societies Act, and are therefore required to submit an annual return to the Registrar. These societies consist mainly of working men, each of whom generally owns only one or two pigs, which he buys in the spring, feeds during the summer, and kills in early winter for home consumption. In 1912, 31 of these societies had 1,461 members, an average of 47 members per society; but one society had only 9 members and another 135. The number of pigs insured was 3,066, so that the average number of pigs insured per society was 99, and per member 2·1. One society insured only 22 pigs and another as many as 391. The number of pigs on which claims were paid during the year was 148, so that the death-rate was for the year 4·8 per cent. of the number of pigs insured. The amount paid on claims, after deducting income from the sale of carcases, was 285*l.*, while the income from insurance contributions was only 239*l.*; but, including interest and other items, the total income of the respective insurance funds of the different societies amounted to 385*l.*, while the total expenditure charged to this head was 375*l.*, so that there was a gain of 10*l.* on the working of the year, and the amount accumulated in the insurance funds of these 31 societies rose from 1,884*l.* at the beginning of the year to 1,894*l.* at the end, an average of more than 12*s.* per pig insured. As this equals more than six times the losses of the year, it forms, on the whole, a very satisfactory reserve. Most of the societies have each a substantial reserve, seven of them having more than 100*l.* each in the savings bank.

The death-rate.

These societies pay insurance claims on all insured pigs which die or have to be slaughtered in consequence of disease or accident, and one of the most important considerations for a society is the average percentage of such claims it may have to meet. According to the experience of 29 of these registered societies for the last three years, out of 3,065 pigs insured 141 died per annum, so that their average annual casualty rate was 4·6 per cent. This rate, however, varies considerably from year to year and from one society to another, and for five rural societies taken together ten years' experience gives an average death-rate on 408 pigs insured of only 3·1 per cent. Two societies have, by careful management of their pigs, succeeded in reducing their average death-rate to about 1 per cent. per annum, and are therefore able to insure their members' pigs at a very cheap rate. The death-rate in societies formed in or near towns is generally a good deal higher than in rural districts. and the experience of existing rural societies goes to show that a society, in an ordinarily healthy country district, may expect to have an average casualty rate of well below 5 per cent. of the insured pigs.

Amount payable per pig.

Nineteen of these 31 societies pay to the owner the full value of the pig at the time it falls ill, but a number of societies pay only a proportion of the value, such as three-fourths or seven-eighths. In practically all societies it is laid down in the rules that anything received for the carcase of an insured pig will go to the credit of the society. Some of the better-managed societies however never sell a pig suspected to be suffering from any disease, but do their best to cure the animal, and if it dies destroy or bury the carcase and stand the loss. The total amount paid in claims in 1912 by 31 registered societies was 331*l.*, and if from this be deducted the 46*l.* received for carcases, the net loss to the societies on the death of 148 pigs was 285*l.*, giving an average loss of 1*l.* 19*s.* per pig that died, and of 1*s.* 10*d.* per pig insured. The experience both of registered and unregistered societies therefore goes to show that on the average the loss per pig that dies is likely to be less than 2*l.*, and to cover this loss even on 5 per cent. of the pigs insured would require an average net income from insurance contributions of less than 2*s.* per pig per annum. So far as the statistics collected go, it appears that the actual average loss in existing societies, both registered and unregistered, is about 1*s.* 10*d.* per annum per pig insured.

Amount of premium paid.

As regards payment of insurance contributions there is a great variety in the practice of the different societies. Most societies have a general meeting once a quarter and require each member to pay his subscription at the meeting; and as usually every member has to pay a full quarterly subscription for at least one pig, whether at the time he has a pig in his possession or not, in the great majority of cases the insurance contribution is actually paid for the whole year. As regards store pigs kept for fattening purposes, it varies from 1*s.* to 6*s.* per annum, the commonest rates being 2*s.*, 3*s*. and 4*s*. Some societies refuse to insure any but store pigs; others will not insure boars, but do insure sows. Where this is done a higher rate is charged for a breeding animal, varying from 3*s*. to 8*s*. 8*d*. per annum. Thus the actual realisations of insurance contributions per pig insured vary considerably from one society to another, but for 31 registered societies in 1912 the actual amount realised under this head was 239*l*., which gives on the 3,066 pigs insured an average insurance charge of 1*s*. 7*d*. per pig. Seeing that the net loss per pig insured was in that year 1*s*. 10*d*., the insurance contributions were not in themselves sufficient to meet the net loss and had to be supplemented by the interest on the reserve fund.

Model rules.

After studying the experience of existing societies and comparing the rules under which they have worked, the Board have, in consultation with the Agricultural Organisation Society and others interested in the subject, drawn up a set of model rules for the guidance of any community which may desire to start a society on similar lines for the insurance of its members' pigs. The object of these rules is to combine the best practice of the most successful societies, but obviously it would not be reasonable for a new society to expect to attain without some experience of its own the standard of management, and especially the low average death-rate, which has been attained by societies of many years' standing. More especially in the matter of the rate of insurance contributions to be charged, it has seemed best to suggest a rate corresponding to the average experience of all the societies regarding which statistics have been collected, *i.e.*, a rate of 2*s*. per annum per store pig, and to leave it to any society to lower the rate of insurance contribution after it has accumulated a substantial reserve fund and proved by its own good management that the rate can be reduced without undue risk. The conditions under which pigs are kept and handled vary greatly in different localities, and it seems probable that in some parts of the country, and especially in the neighbourhood of large towns, pig-owners may find that they cannot keep the death-rate down so low as 5 per cent. per annum, which is about the average rate in existing societies; and if their experience proves that this is the case, they may find it necessary to impose a higher insurance contribution than 6*d*. per quarter per store pig. But in the great majority of rural parishes it ought to be possible with ordinary care to keep the death-rate below this average, and to find that, with an insurance contribution fixed at the rate suggested, a satisfactory reserve fund will soon be accumulated.

Re-insurance.

One of the dangers to which a small pig insurance society is exposed is that, owing to the outbreak of some contagious disease, a considerable proportion of the insured pigs owned by the members might die within a short period and have to be paid for from the funds of the society, and this might involve a heavy levy on the members in addition to their usual insurance contributions. In this country, however, that danger is to some extent reduced where the disease is swine fever, as the Board in some outbreaks slaughter a portion or the whole of the swine on the premises, paying compensation for pigs so slaughtered. On the average of the five years ending March, 1913, there have been annually in Great Britain 2,154 outbreaks of swine fever, in consequence of which 23,591 pigs were slaughtered by order and 32,869*l.* was paid as compensation from public funds, so that the average number slaughtered was 11 pigs per outbreak, and the average amount of compensation paid was about 1*l.* 8*s.* per pig slaughtered, and about 15*l.* per outbreak. The model rules provide that the compensation paid by the Board is to be deducted from the compensation payable under the rules, so that in the case of swine fever the amount of compensation payable by the society will not exceed the value of pigs which have actually died from that disease, and a portion of the value of the pigs which have been slaughtered by the Board.

There is, however, the possibility that, owing to a succession of bad years, the losses may exceed the ordinary insurance contributions, and it is for this reason that it is so important that a pig insurance society, which has no outside resources to depend upon, should build up a substantial reserve fund against the risk of having to make levies on its members to meet such deficiencies. This risk may be greatly reduced by a system of re-insurance, under which a larger body will undertake, in return for a proportion of the insurance contributions, to pay a proportion of the losses incurred by the society. Such a system has been arranged by the Agricultural and General Co-operative Insurance Society, Ltd., which has expressed its willingness to re-insure half the net risks of any local co-operative pig insurance society, if satisfied with its rules and financial position, on payment of half the insurance contributions received by the local society, less 10 per cent. of that half. Under this plan it will not be necessary for the local society to build up such a large reserve fund as if it had to depend entirely upon its own resources, seeing that the amount it will have to provide for in the case of a deficiency will only be half of what it is in the case of a society which has not re-insured its risks. The pig clubs for which statistics have been collected hold reserve funds amounting altogether to nearly 30,000*l.*, mostly representing the savings of working men. This large sum is wisely kept in the savings bank, but there it only earns 2½ per cent. interest, and so far as it is unnecessarily large, it involves a loss in possible usefulness to the members of the societies which have saved up this amount. If it can be reduced with safety, those members will be able to reap a greater advantage from their past thrift and good management. In the model rules it is provided that, whenever the balance to the credit of the insurance fund of any society is shown by the audited accounts of any year to exceed the equivalent of 10*s.* per pig on the maximum number of pigs insured during the year, the insurance contributions of all members of over five years' standing shall be reduced to half the usual rates for the following twelve months. The reason why 10*s.* per pig has been selected as the maximum insurance fund to be aimed at is that the average amount of compensation annually payable by insurance societies is found to be under 2*s.* per pig on the number of pigs insured, so that a reserve fund of 10*s.* per pig would in itself cover the average losses of five years; and this seems a sufficient reserve for a self-supporting society. But if, under a contract of re-insurance, a local society remains liable for only half the total amount of compensation payable, it need only expect an average loss to itself of less than 1*s.* per pig insured per annum; so that in that case a reserve fund of 5*s.* per pig insured would be sufficient to meet the average losses of five years. Such a society may therefore safely grant to its old members the benefit of a reduction of the insurance contributions to half the usual rates, so long as the balance at the credit of the insurance fund exceeds that amount. Where this is done the old members will be able to insure their pigs on payment of 1*s.* per pig for insurance contribution and 1*s.* for management expenses—that is, altogether, 2*s.* per pig per annum.

Co-operative cow insurance societies. Registered societies.

At the end of 1912 there were in operation in England and Wales 22 co-operative cow insurance societies registered under the Friendly Societies Act. Statistics have been obtained for 21 of those societies for the year 1912. The total number of members was 1,498, which gives an average of 71 members per society, the number varying from 12 in one society to 298 in another. The number of cows and calves insured was 4,639, an average of 221 animals insured per society and of 3·1 animals insured per member. The smallest number of animals insured for any one society was

12 and the largest 1,395. The number of animals on which claims were paid during the year was 113, which gives an average death-rate of 2·4 per cent. of the animals insured. The amount paid on claims, after deducting income from sale of carcases, was 933*l.*, while the income from insurance contributions was 938*l.*, which just covered the losses of the year. The total expenditure charged to the insurance fund was 1,030*l.*, while the total income of that fund, which included, besides the 64*l.* received from sale of carcases, 108*l.* received as interest and 15*l.* from special levies made in two societies, was 1,145*l.*, so that the working of the year resulted for all the societies put together in a net gain of 115*l.*, and their reserve funds rose from 4,757*l.* at the beginning of the year to 4,872*l.* at its close. There was also a small balance to the credit of the management fund, and the total assets of these societies at the end of the year, after deducting their total liabilities, amounted to 4,881*l.*, almost the whole of which was deposited in the savings bank. This amounts to nearly five times the losses of the year, so that it forms a very good security to the members against the risk of having to make special levies to meet deficiencies in the funds, and on the whole these societies are evidently in a satisfactory financial position.

The death-rate.

These societies all pay insurance claims on any insured cow or female calf which dies or has to be slaughtered in consequence of disease or accident. Their experience has been as follows :—

Year.	Number of societies reporting.	Number of cows and calves insured.	Number of cows and calves on which claims were paid.	Average death-rate per cent. per annum.
1910 …………	17	4,243	94	2·2
'11 …………	22	4,517	118	2·6
'12 …………	21	4,639	113	2·4
Average….	20	4,450	108	2·4

Putting together the experience of the three years, the average death-rate for these societies has been 2·4 per cent. per annum on 4,450 animals. The highest mortality occurred in the very dry year, 1911.

Amount payable per cow or calf.

Last year, on 113 animals that died, the amount paid by societies was 997*l.* Deducting from this the 64*l.* received from sale of carcases, the net loss to the societies was 933*l.*, which gives an average of 8*l.* 5*s.* per animal that died, and of 4*s.* per animal insured. Here again the experience of the last two years is as follows :—

Year.	Number of animals insured.	Number of animals that died.	Amount paid on claims.	Receipts from sale of carcases.	Net loss.	Average per animal that died.	Average per animal insured.
			£	£	£	£ *s.*	*s.* *d.*
1911........	4,517	118	1,019	36	983	8 7	4 4
'12........	4,639	113	997	64	933	8 5	4 0
Average	4,578	116	1,008	50	958	8 6	4 2

From the experience of these two years it appears that a society may expect to have to pay on the average 8*l.* 6*s.* per animal that dies, and that to cover the losses under the present rules and practice a net premium income of 4*s.* 2*d.* per animal insured would be required.

Amount of premium paid.

The experience of the last two years has been as follows :—

Year.	Number of animals insured.	Amount of insurance contributions and levies received.	Average per animal insured.
		£	*s.* *d.*
1911....................	4,517	936	4 2
'12....................	4,639	953	4 1
Average	4,578	945	4 2

The income received under this head by itself almost exactly equalled the net loss on claims, leaving as clear profit the interest received on accumulated funds.

Management expenses.

In the case of 15 societies a separate account was kept of the income and expenditure of the management fund, and in the case of these societies the expenditure amounted to 95*l.* in the course of the year, including 47*l.* for salaries. As those societies altogether insured 4,073 animals, the average expenditure per animal insured was 6*d.* as compared with 5*d.* in the previous year.

Unregistered cow insurance societies.

Besides these registered societies there are, according to the information at the disposal of the Board, 113 similar societies for the insurance of cows which have not been registered. Statistics for 1911 have been received for 64 of these clubs, which consist of 2,081 members, an average of 33 members per club. The number of cows these clubs insured was 5,335, an average of 83 cows per club and of 2·6 cows per member. Of these, claims had to be paid on 146 cows during the year, an average death-rate of 2·7 per cent. per annum. The amount paid in claims was 1,347*l.*, an average of 9*l.* 5*s.* per animal that died and of 5*s.* 1*d.* per animal insured. Against this, however, should be put the amount realised on sale of carcases, which has not been ascertained. The total amount received in insurance contributions was 1,445*l.*, an average of 5*s.* 5*d.* per animal insured. These 64 clubs had at the end of the year reserve funds amounting to 5,542*l.*, which is equal to four times the amount paid on claims during the year, so that evidently most of them are in a satisfactory position.

Summary of experience.

Thus we have the experience of 86 cow insurance societies in different parts of the country, consisting of 3,579 members and insuring 9,974 cows and calves per annum, according to which the average death-rate to be expected by such a society is about 2½ per cent. per annum of the cows insured, and the average loss, after deducting income from sale of carcases, is likely to be well under 5*s.* per cow per annum. So that if a society, in an ordinarily healthy part of the country, charges this rate of insurance contribution and 1*s.* per cow per annum for costs of management, it may reasonably expect, like most of the existing societies, to build up gradually a substantial reserve fund, which will relieve its members of the risk of having to make a special levy on themselves to meet the losses of an exceptional year. These 86 societies now hold reserves of over 10,000*l.*, almost the whole of which is deposited in the savings bank. As the insurance contract is completed quarter by quarter, this sum represents the net assets of the societies, and has been accumulated out of the profits of working since the commencement of each society. This is a very satisfactory state of affairs, but it is obvious that there must be some limit beyond which it is not reasonably necessary to add to the reserve. It is, perhaps, enough for each society, as in the case of the pig clubs, to aim at providing a reserve which by itself would be sufficient to meet the losses of five years; and as the full statistics available for registered societies show that on the average the loss represented by claims, after deducting the amount received from sale of carcases, amounts to about 4*s.* per animal insured, it would seem sufficient for a society to aim at accumulating a reserve fund equal to 1*l.* per animal insured. This satisfactory position has already been attained by a number of these societies. Some of them, recognising that the reserve was larger than necessary, have distributed or arranged in their rules to distribute the surplus among the members. It seems wasteful to dissipate in this way the savings which the society and its members have accumulated by the good management of past years, and it would appear to be much more in accordance with co-operative principles and much more beneficial to the members of the societies if, instead of dividing the surplus, societies would follow the example of some clubs which utilise their strong financial position to reduce the charge made to old members of the society, while retaining the full rates of contribution for new members. Under an arrangement of this sort the Prees Cow Club has recently reduced the total charge made to members of ten years' standing to 3*s.* per cow per annum, and in return for this small payment each of the old members has his cows insured with the society to their full market value, subject to a maximum of 12*l.* Accordingly in the model rules for cow insurance societies, based upon the experience of existing cow clubs, which will shortly be issued, it is provided that, whenever the balance at the credit of the insurance fund is shown by the audited accounts of any year to exceed the equivalent of 1*l.* per animal on the maximum number of animals insured during the year, the insurance contributions of all members of over five years' standing shall be reduced to one-half the usual rates for the following twelve months. If this rule is adopted by existing societies, those of them which already have accumulated a reserve fund exceeding this amount will be able at once to give a substantial reduction in insurance contributions to all their old members, without any risk of reducing their reserve below a safe limit.

Re-insurance.

As in the case of the pig clubs, each of these small local societies is self-supporting and independent, and undertakes the whole of its own risks. There is always a danger that, owing to the outbreak of an epidemic in the area covered by the society's operations, its losses may be considerable, and may involve the exhaustion of the reserve fund, and the necessity of making a levy upon the members to make up the amount required to pay the losses. This risk, however, is not so great as at first sight appears. There has been no outbreak of cattle plague in this country since 1877, or of pleuro-pneumonia since 1898. The number of cattle attacked by anthrax in Great Britain has, on the average of the last five years, been only 1,057 per annum, and for the same five years the average annual number of outbreaks of foot and mouth disease has been only 20, the average number of cattle attacked 105, and the number of cattle slaughtered as diseased or as having been exposed to infection has averaged only 721 per annum. Seeing that there are in Great Britain 7,000,000 cattle, it is obvious that the risk to any individual cow of being affected by any of these diseases or slaughtered in consequence of an outbreak of any of them is very small. In the case of foot-and-mouth disease, when an animal is slaughtered by order of the Board of Agriculture compensation either in full or in part is paid by the Board, and the local insurance society has only to make up the difference, if any, between that compensation and the animal's market value, so that even in the case of an outbreak of foot-and-mouth disease in its area, a society might not have to pay any large amount of compensation. Still, there is always the possibility that, owing to a succession of bad years, the losses may considerably exceed the insurance contributions of those years, and in such a case it may become necessary for the society either to draw upon its reserve or to make a levy upon its members.

With the object of reducing this risk the Agricultural and General Co-operative Insurance Society, Limited, has arranged, as in the case of pigs, to re-insure half the net risks of any approved local co-operative cow insurance society on payment of half the insurance contributions received by the local society, less 10 per cent. of that half. The experience of existing societies shows that, on the average, a society which had made such a contract of re-insurance would only have to find an amount equivalent to about 2*s*. per cow per annum towards meeting its half of the losses, so that a reserve fund of 10*s*. per animal insured would be sufficient to cover the average losses of five years. Therefore it would seem safe for a society which has re-insured half its risks to grant to its old members the benefit of a reduction of the insurance contributions to half the usual rates, whenever the balance at the credit of the insurance fund exceeds the equivalent of 10*s*. per cow insured.

In that case the old members of a well-established society will have their insurance contributions reduced to about 2*s*. 6*d*. per cow per annum, making, with the contribution for management expenses, a total payment of about 3*s*. 6*d*. per cow per annum to cover loss by death, accident or disease; while, to insure against a similar risk with an ordinary live-stock insurance company, a premium of 15*s*. or 18*s*. per annum would have to be paid.

DISCUSSION *on* SIR JAMES WILSON'S PAPER.

SIR EDWARD BRABROOK said, having had to do with the registration of these clubs for many years, he might be permitted to say a few words. Although the registered clubs formed a very small proportion of the total which had been surveyed by Sir James Wilson, yet the experience appeared to be so similar that they might be taken as a kind of sample of the whole. It was a curious circumstance in relation to the statute under which the registration of these clubs took place (29 Vict. c. 34), that it was passed under the influence of a panic from the cattle plague, and it was thought that the passing of the Act would result in the establishment of a number of large concerns covering a great deal of the agricultural surface of the country, and insuring large sums on valuable cattle. It was for that reason that a special section was introduced exempting the cattle insurance societies from the limit of 200*l.* for each insurance which was prescribed by the Friendly Societies Act for ordinary friendly societies. The result had been that instead of these great concerns insuring more than 200*l.*, they had these small pig clubs and cow clubs, which insured for small sums, and which had had a successful career. He thought that little circumstance might be interesting to the Society. He offered thanks to Sir James Wilson for his excellent Paper.

MR. ARTHUR J. COOK said it might not be uninteresting to mention that in the *Histoire générale de l'Assurance*, by M. Hamon, it was stated that passages in the Talmud showed that the ancient Hebrews, during their wanderings through Palestine, mutually insured their asses and mules, and that money was not given in settlement of a claim: a live animal was substituted for the dead one. Then in Walford's *Insurance Cyclopædia* it was shown that livestock insurance existed in Spain in 1556. Those who read the work would also find that since that date many proprietary and mutual companies in this country had tried to transact livestock insurance, but most of them had had to go into liquidation. The chief reasons were, he believed, first the expensive periodical supervision of the risks which was necessary, and secondly, excessive claims, several of which were fraudulent. It was found that if the rates of premium were low enough to tempt owners to insure they were not sufficiently high to cover claims and expenses. In most countries of Europe livestock insurance was chiefly carried on by mutual societies. In some of the cantons of Switzerland the insurance of livestock was obligatory in local societies and the cantons granted subsidies to the societies. A certain proportion of the subsidies were repaid to the cantons by the confederation. In other cantons, and in France and Germany especially, there were many mutual livestock insurance societies. It was the general rule of such Continental societies to pay no more than 75 to 80 per cent. of the admitted claims. In view of the facts given in the Paper and of those he had mentioned he considered that mutual, localised societies—of a fair size—were likely to show the best results.

Sir JAMES WILSON, in reply, said he had been studying to a certain extent the livestock insurance societies in many parts of the Continent, and it was interesting to compare their experience with that of the English societies; but it was not very easy because the basis of their insurance was not always the same. Many of them were supported by the Government, or by local bodies; whereas the societies in this country received no support at all from any Government Department, and, until a recent date, had not even received any advice from outside. It was very interesting to see how they had grown up spontaneously in each little village, and had worked out their own experience. Having collected that experience, they now hoped they would be able to help other villages to follow the example of those which had led the way so successfully.

Some MATERIAL *for a* STUDY *of* TRADE FLUCTUATIONS.

By D. H. ROBERTSON.

[Read before the Royal Statistical Society, December 16, 1913, the President, Professor F. Y. EDGEWORTH, M.A., F.B.A., in the Chair.]

THE following notes are the product neither of original statistical inquiry nor of elaborate statistical manipulation. They are simply a discussion of certain easily accessible facts and figures so far as they bear on the question of the origin and character of the so-called cyclical fluctuations of trade. Apology is also needed for the apparently disconnected nature of the notes; the connection of thought between them belongs to a larger argument necessarily omitted.

§ 1. *The influence of the period of gestation.*

It has been suggested in various quarters, notably by Professor Aftalion, of Lille, that the boom in any trade is prolonged and the depression aggravated by the length of time required to construct and to bring into working order the instruments of production. In support of this theory M. Aftalion gives interesting statistical evidence from the French *Statistique de l'Industrie Minérale* to the effect that the horse-power of the machinery employed in various industries does not increase notably for some time after the beginning of the boom, as indicated by the movements of general prices, and continues to increase for from one to three years after the break in general prices.[1] Similar evidence of a rather more precise character seems to be available for some English industries.

(i) *The railway boom of the '40's.*—The following figures[2] suggest that in this case the period of gestation was about two years:—

	Mileage authorised.	Mileage opened.		Mileage authorised.	Mileage opened.
1843	Inconsiderable	....	1847	1,663	909
'44	797	....	'48	300	1,182
'45	2,883	..	'49	....	904
'46	4,790	595	'50	....	590

(ii) *Pig iron and coal.*—It will be noticed from the figures given in Table I that the price of coal tends to reach both its maxima and minima later than that of pig iron. While there are other causes for this, part of the explanation seems to lie in the longer period of gestation necessary in the coal trade. According to Mr. Hull[3] it takes "practically a year" in America to build a new blast furnace. From an English ironmaster I gather the impression that in this country some fifteen months would be required. But a coal mine which is begun to be sunk now will not be in working order for several years. Further, it seems likely that the period of gestation in the coal trade should have become longer during the past half century with the necessity of sinking deeper shafts. It is likely perhaps, moreover, to be longer for those mines sunk towards the end than for those sunk towards the beginning of the boom.

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[1] Aftalion, *Les Crises périodiques de Surproduction*, vol ii, book vi, ch. 3.

[2] From *Whitaker's Almanack*.

This *à priori* reasoning is confirmed by the figures. In the boom of the '70's the first considerable rise in prices took place in 1872, and began to make its full effect on output felt in 1875. Between the break of prices in 1873 and the new influx of 1875 there was restriction of output.[4] Again, since new enterprises were apparently begun at least as late as 1874,[5] production was not restrained till 1878, though, indeed, by the latter year some of the worst mines had begun to go out of use.[6]

In the next cycle the first considerable rise in prices was in 1882; consequently (assuming the period to have increased to about five years) the new influx was delayed till 1887. High prices continued till 1884, and large production till 1889; but by 1890 (five years after the slump) we might expect to find some restriction, had not a new demand for coal arisen in that year, so that the end of this cycle is, as it were, telescoped into the beginning of the next.

In the next cycle high prices began in 1889 and ended in 1891, so that (still with a five years' period) the new influx began in 1894 and increased till 1896. Again, a new demand for coal arose in 1897, so that this cycle and the next are telescoped together. The assumption of a five-year period also explains the curious stagnation of production, in spite of rising prices, in 1898. Investment in new mines does not cease altogether even in years of low prices; it is only less extensive than in times of boom. But in the year of the great strike (1893) it is likely to have been considerably less than usual, hence the comparative shortage in 1898.

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[3] *Industrial Depression*, p. 207.

[4] The initial break in prices must, I think (in opposition to M. Aftalion), be referred to a relapse in demand.

[5] In December, 1873, we learn that "the proposed line from Mansfield to Worksop will aid materially in opening out a vast tract of highly mineralised ground, so that collieries will be opened out in a straight course of from 30 to 40 miles."—*Economist* History of 1874. And "during 1875 no less than 111 new collieries were in the course of sinking in the West Riding of Yorkshire alone." —*Id.*, of 1876.

[6] Number of collieries working: 1873, 3,627; 1875, 4,501; 1877, 4,231. *Times*, January 1, 1878.

In the next cycle the analogous quinquennia are 1897–1902 and 1901–06, leaving room for restriction of output in 1901. Again, as on every occasion except 1878–79, the final curtailment is rendered superfluous by rising demand. In the next cycle it seems more reasonable to refer the new growth of output in 1909 to failure to check permanently the vast additions to the source of supply made in the 1900 boom than to the boom of 1906–07, which supposes an improbably short period of gestation. Indeed, I have heard of enterprises undertaken in the 1900 boom which, even in 1912, were not in working order; and, of course, in every case the new mines of one cycle form a permanent addition to productive capacity, ready to take advantage of the first stirrings of demand in the next—witness the large expansion of output under an apparently inadequate price-stimulus in 1880–81.

Mr. D. A. Thomas, indeed, in his celebrated Paper before this Society in 1903, asserted that very new enterprises had been started in the 1900 boom, but his estimate seems to have been falsified by the subsequent course of prices and production. But it seems not impossible that the period of gestation is becoming so long as to exert an appreciable influence against over-investment in times of boom. In this case a secular change, such as the working-out of the English coalfields, is important not only in itself, but in its influence on the course of "cyclical" fluctuation.

(iii) *Freights and shipbuilding.*—The actual time occupied in building a tramp steamer of the usual size, *i.e.*, about 7,000 tons,[7] under favourable conditions—*i.e.*, if there is no exceptional scarcity of labour or materials—is under a year. Hence we might expect to find the new tonnage beginning, within a year after the beginning of a boom, to show its effect in reducing the orders for new construction. We may explain on these lines the check to new contracts in the fourth quarter of 1910 (see Table II). As a rule, however, the flood-tide of demand seems to carry the volume of contracts over this first dead point. And as the tide flows the period of gestation lengthens, for—(1) the capacity of the yards is limited, so that some months may elapse after the placing of an order before the vessel is begun; (2) there is a growing pressure on the supplies of labour and materials, so that delays occur also *after* construction has begun.[8] Thus the period is prolonged to as much as eighteen months. For instance, the flood of new ships launched early in 1906 seems to have been composed largely of those ordered late in 1904[9], and at the end of 1912 builders were stated to be full of work well into 1914.[10]

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[7] The *average* tonnage of the ships built in 1912 was 2,676, and this figure was exceptionally high; but the *most frequent* size was much greater. Thus of the 108 ships under construction, December 31, 1912, 69 were between 6,000 and 10,000 tons (*Lloyd's Register Annual Summary*).

The first severe falling-off in new contracts is thus often found some fifteen to eighteen months after—not the first increase—but an exceptionally large increase in the volume of such contracts. Compare the third quarter of 1889 with the first of 1888, the first of 1899 with the last of 1897, the third of 1906 with the first of 1905, the second of 1913 with the first of 1912. Yet even so, the flood of demand is not exhausted. Some eighteen months after the maximum of tonnage under construction is reached, *i.e.*, just when the efflux of new ships from the yards is likely to have spent its full force, there are often signs of a renewal of orders, and a second or even a third maximum is attained, sometimes, though not always (1901), subordinate. Compare the last quarters of 1891 and 1892 with the second and third of 1889 and 1890 respectively, and the second and fourth of 1900 with the first and third of 1899.

Adequate discussion of the causes of the initial rises in the volume of contracts would be out of place here, but there is one feature directly relevant to the present discussion. The successive peaks in the curve of new contracts have often to be referred to different sources of demand, *e.g.*, that in 1886 (4) and 1887 (1) to homeward Atlantic, that in 1888–89 to home Black Sea and outward Argentine, that in 1891 (4) again to homeward Atlantic freights; again, that in 1896 (4) to Far Eastern, in 1897–98 to Atlantic, in 1900 to South African conditions; that of 1909 mainly to Indian and Manchurian, that of 1910 mainly to Russian demand. This suggests that under the influence of the period of production a series of isolated ripples of demand is able to exercise an effect upon output which resembles that of one continuous and concentrated breaker.[11] Further, in spite of the well-known willingness of tramps to undertake long voyages in ballast in the hope of return cargoes, there appears still to be a considerable friction due to distance: *e.g.*, in spite of the failure of the Russian demand in the end of 1891, freights remained high in the North Atlantic trade, and were a sore temptation to incautious owners to increase their tonnage. Similarly the concentration of steamers in the Far East after the Chino-Japanese War in 1896, and in Australia owing to the miners' strike in 1909, raised freights in other trades and increased the volume of new contracts, though the total supply of tonnage was fully adequate to the demand. In other words, in this trade we have to consider the influence not only of the period of gestation but of what I may call the period of transference upon the course of investment.

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[8] The delay may be enhanced by labour disputes, *e.g.*, the boilermakers' lock-out (1910) and the coal-strike (1912).

[9] *Cf. Economist*, 1906, p. 1207.

[10] Messrs. Moss' Circular, January 1, 1913. In view of the large part played by tank-steamers in the recent record shipbuilding boom, it is significant that "it takes much longer to build an oil-tank steamer than an ordinary steamer" (*Statist*, August 10, 1912).

(iv) *Cotton spinning.*—A comparison (see Table III) of the average profits of 100 firms (Mr. John Kidger, of Oldham[12]) and of the net increase in the number of spindles at work (Messrs. Ellison's estimate[13]), *e.g.*, in 1888–89, 1890–91, suggests that at the beginning of a boom the period of gestation is about a year. When the wave of rising demand is prolonged, however, we should expect it to become somewhat longer. This is confirmed by the following figures from a series of annual articles in the *Economist* for January:—

[In thousands.]

	Spindles in mills under construction, January 1.	New spindles started in year.		Spindles in mills under construction, January 1.	New spindles started in year.
1899	700	340	1905	2,985	1,460*
1900	880	708	'06	4,350	3,029
'01	1,025	665	'07	4,301	2,249
'02	1,140	951	'08	4,363	1,660
'03	720	?	'09	3,043	?
'04	?	?			

* Last six months.

Assuming a uniform rate of contracting and construction the typical period of gestation for any year is given by dividing column 1 by column 2.[14] The result is 1·24 years for 1900, 1·13 for 1901, 1·44 for 1906, 1·91 for 1907 and 2·63 for 1908. This result suggests among other things that the period of gestation is longer, and the subsequent slump therefore more acute, when the cotton boom synchronises closely than when it lags behind the constructional boom.

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[11] Further, the rise in an important source of demand sets psychological influences to work, which are not allayed by the fall of that and the rise of other streams, *i.e.*, the compensatory action of a widespread demand is not completely operative.

[12] Quoted in *Economist* Annual Histories.

[13] 3rd Fiscal Bluebook, Cd-4954, 1909, p. 157.

(v) *Coffee.*—"The coffee plant," says a writer in the *Economist*,[15] "does not produce marketable berries for five years"—in other words, five years is here the normal period of gestation. It is therefore significant that the first check to the coffee glut which marked the turn of the century occurred in 1903, five years after the first loud complaints of over-production.

The big crop of 1906 induced the Brazilian Government to undertake its "valorisation" scheme, and was followed by the immense production of 1907. It may be pointed out that the reduced crop of 1903 was originally estimated at the still smaller figure of 8,000,000 to 9,000,000 bags; that this may well have led to extended plantings, and that the favourable weather which produced the record crop of 1907 may well have brought some plants to maturity before the normal time. Nor, I think, is it accidental that the maximum crop of 1910 occurred five years after the minimum crop of 1905, the minimum of 1911 five years after the large crop of 1906, which brought the anxiety of growers to a head; the new maximum of 1912, five years after their hopes had again been raised by the high-sounding pretensions of the Government; and the relapse of 1913, five years after the futility of the scheme had become obvious. We may, perhaps, expect some further reduction in the 1914[16] crop, to be followed by an increase in 1915, five years after the high-priced year 1910. The importance of these oscillations to the Dundee jute trade are well seen in Table IV.[17]

§ 2. *The influence of the length of life of the instrument.*

Karl Marx long ago suggested[18] that the decennial character of crises was due to the fact that the fixed capital of the world needs replacement every ten years. This suggestion appears, indeed, to have been of the nature of a guess to explain the facts, but it has not, perhaps, received adequate attention at the hands of subsequent writers.

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[14] For instance, of the 700,000 spindles under construction on January 1, 1899, only 340,000 came into being during the year: the time required to complete 700,000 is, therefore, $\frac{700}{340}$ year.

[15] 1911, vol. i, p. 257.

[16] Though the preliminary estimates do not confirm this view.

[17] Brazil takes about half our exports of jute-yarn.

[18] *Capital*, vol. ii, part ii, ch. 9 (Eng. vi, p. 211).

(i) *Railways.*—The late editor of the *Reports of the British Iron Trade Association*[19] estimates the average life of an iron rail at ten years. And the only instrument for which Marx is definitely prepared to assert a ten years' life is the railway locomotive. It seems possible that this throws some light on the successive outbursts of English railway investment, which (comparing Table V with our hypothesis of a two-years' period of gestation) we must date at 1834, 1844, 1854, 1863, the last revival being hastened by the Joint-Stock Acts, just as we find an intermediate revival in 1860 precipitated by the Limited Liability Act of 1859 and telling on the mileage of 1862. In the mileage expansions of 1868–69[20] and 1878–79 we have the harmonics of the series beginning with the invention of railways, and in those of 1872–74 and 1882 the harmonics of the series beginning with the extended facilities for joint-stock enterprise. After this the life of the iron rail, of course, becomes irrelevant. I do not make this suggestion with any confidence, but I do not think it is entirely fanciful.

(ii) *Cotton spinning.*—It is, at least, curious that for the machinery of the other industry which played a leading part in the English crises of the first part of the nineteenth century, Professor Taussig estimates an average life of ten years. In Lancashire, at the present day, according to an expert informant, it is usual to write down the value of engines and boilers by 10 per cent. per annum. Machinery, however, is commonly written down 7½ per cent., and it is possible that the thirteen-years' period thus suggested helps to explain the net decrease of spinning capacity in 1896 (thirteen years after the prosperity of 1883), its stagnation in 1903 (thirteen years after the maximum profits of 1890), and its very moderate increase, in spite of high profits, in 1912 (thirteen years after the maximum profits of 1899).[21] (See Table III.)

(iii) *Shipbuilding.*—The *Economist* of 1884 estimates the annual loss of tonnage from the British register at 5 per cent. of the total tonnage existing at the beginning of the year. At first sight this seems to correspond with the estimate given me by a Liverpool shipowner of twenty years as the average length of life of a vessel upon the British register. There are various reasons, however, for considering this estimate too large :—(1) The 1884 figures include only tonnage destroyed, not that transferred to other countries ; (2) with a steadily growing tonnage an indication of the length of life of a vessel is given by the inverse of the fraction obtained by dividing the total loss in any year *not* by the tonnage in existence at the beginning of the year, but by the average tonnage in existence during a period, dating back from the said year, equal to the length of life in question.[22]

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[19] *Review of* 1878, introduction.

[20] Supposing the revival shown in the mileage of 1865-69 to have been prematurely cut short by the "joint-stock" crisis of 1866, and to have been resumed, without need of further stimulus from renewals, in the mileage of 1868-69.

[21] I have no similar information for the woollen industry, but it is at least curious that the great booms in that trade in recent years were in 1886, 1899 and 1912, *i.e.*, at intervals of thirteen years.

From the figures given in Table VI, taking the average value of the formula in the footnote, we obtain an average length of life of 16·8 years. This result is confirmed by the figures given in Table VII. When we remember that in years of high freights (such as 1898–1900 and 1912) the foreign sales are naturally unusually large, and likely to contain an unusually large percentage of fairly new ships, and conversely in years of depression, such as 1908, we may with some confidence place the median of the 1885, 1890 and 1895 curves in 1901, 1906–07 and 1912 respectively, which, if we assume a correspondence of the median and the mode, corresponds admirably with our sixteen to seventeen years' period.

We shall then see in the large natural losses and sales of 1890–91 the harmonics of the large output of 1874 ; in the large natural losses of 1896–97 and sales of 1895 and 1898–99, those of the outburst of 1880–83 ; in the losses of 1903–05 the echoes of the great output of 1888–89 ; and in those of 1908–10 the echoes of 1891–92.[23]

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[22] If a is the amount on the register at the beginning of the year, b the total loss during the year, c the average annual net increase in tonnage (assumed to be uniform throughout the period), x the length of life, we get the formula :

$$\frac{1}{x} = \frac{b}{a - \frac{1}{2}xc} \quad \text{or } x = \frac{a}{b + \frac{c}{2}}$$

[23] The large foreign sales of 1900 must be attributed to high freights. But conversely both the sale and break-up of ships is precipitated by low freights : hence we may legitimately connect the large sales of 1895 with the 1880 boom, and the large "loss" of 1903 with 1888. *Cf.* Board of Trade Freight Index (1900 = 100).

1893	83·6	1896	79·4	1901	75·0
'94	79·8	'97	82·9	'02	70·7
'95	75·3	1900	100·0	'03	72·8

The high pre-1895 percentage for 1910 and the loud and general complaints and warnings of an over-supply of antiquated tonnage (*cf. Economist*, 1910, i, 430, and *Moss Circular*, July 1, 1910), justify us in assuming that the ships eventually broken up in that year had had an unusually long life.

These considerations help to explain the revival of contracts in the last quarters of 1890 and 1891, when the apex of the freight boom was already passed; the curious increase, during the prevalence of low freights, in the second half of 1895 and the first of 1896; the similar phenomenon in 1904 and 1908 (4) and 1909 (1); as well as the first wave of the subsequent boom now just beginning to ebb.

(iv) *Housebuilding and coffee.*—The almost infinite length of life (from a cyclical point of view) of the instrument of production of house room explains the chronic stagnation of the building trade since the boom towards the end of the 90's—its failure to participate in the boom of 1906–07 and its reluctance to follow that of recent years. The coffee plant ceases to yield good crops after its twentieth year,[24] so that towards the end of this decade we may witness a falling-off of production due to the wearing out of the plants which caused the trouble at the end of last century.

(v) *Pig-iron and coal.*—But we have to consider not only the length of life of the instrument, but also the facility with which it can be temporarily put out of use. This furnishes an additional explanation of the greater severity of depression in the coal than in the pig-iron trade. For technical reasons a mineowner is very unwilling to shut down a colliery[25]; but the damping down of a blast furnace, though inconvenient and costly, is not half so serious a matter. Indeed, in this country, even in boom years, a large percentage of the furnaces in existence is out of use.

	Furnaces in existence.	In blast (average for year).		Furnaces in existence.	In blast (average for year).
1880 ……..	959	590	1900 ….	562	397
'89 ……..	813	477·10	'06 ……..	517	367·75
'99 ……..	596	409	'07 ……..	507	366·25[26]

Hence, even if over-investment has been less in coal than in iron, its effects on prices are more severe.[27]

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[24] Bartholomew's *Atlas of the World's Commerce*, p. 85.

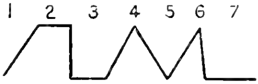
[25] "When long-wall is the system of working, then there is a serious risk that the roof may fall in, and the working faces be closed up if any portion of the pit is left unworked for more than a few days."—*Economist* History of 1896, p. 20.

[26] Figures from *Brit. Iron Trade Ass. Reports*.

[27] According to figures given by Sir Robert Giffen (quoted *Ibid.*, 1878) between 1867 and 1875 the capital invested in ironworks increased 314 per cent., in mines only 195 per cent. But it will be seen that in the depression of the '70's, the price of coal fell 63 per cent., the price of pig-iron 58 per cent. below the maximum of 1872.

Similarly, the restriction of pig-iron output in America *after*—in England (see Table I) *before*—the break in prices, in spite of the greater effectiveness of combination in America, may, I think, be due to the superior capacity of the American furnaces (in 1905 twice, or in Pennsylvania nearly three times the 28,000 tons typical of this country[28]), which renders their damping down a more serious matter.

(vi) *Oil.*—There is, of course, no uniform length of life for an oil-field; but Table VIII, combined with other evidence,[29] suggests that its typical history may be represented as follows:—



Stage 1 represents the gradual increase during the period of exploration, 2 the activity of spontaneous "gushers," 3 the exhaustion of the latter, 4 the gradual increase of production by pumping, 5 the natural exhaustion of the wells, 6 the desperate efforts by improved apparatus and new sinkings to postpone the evil day, 7 the final relapse into passivity. 1–4 are well represented by the Dutch Indies, 1901–06, and Mexico, 1907–11; 5–7 by the Appalachian field.

The simultaneous attainment of 5 by the Baku and Pennsylvanian wells [Table VIIIA] led to the boom in the Scottish mineral oil trade in 1903, that of stage 6 to the relapse in 1904; but in 1906 their arrival at 7 and the simultaneous arrival of the Texas field at 3[30] led to a shortage which precipitated the first wave of the great oil boom.

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[28] Jean's *English Iron Industry*, p. 41.

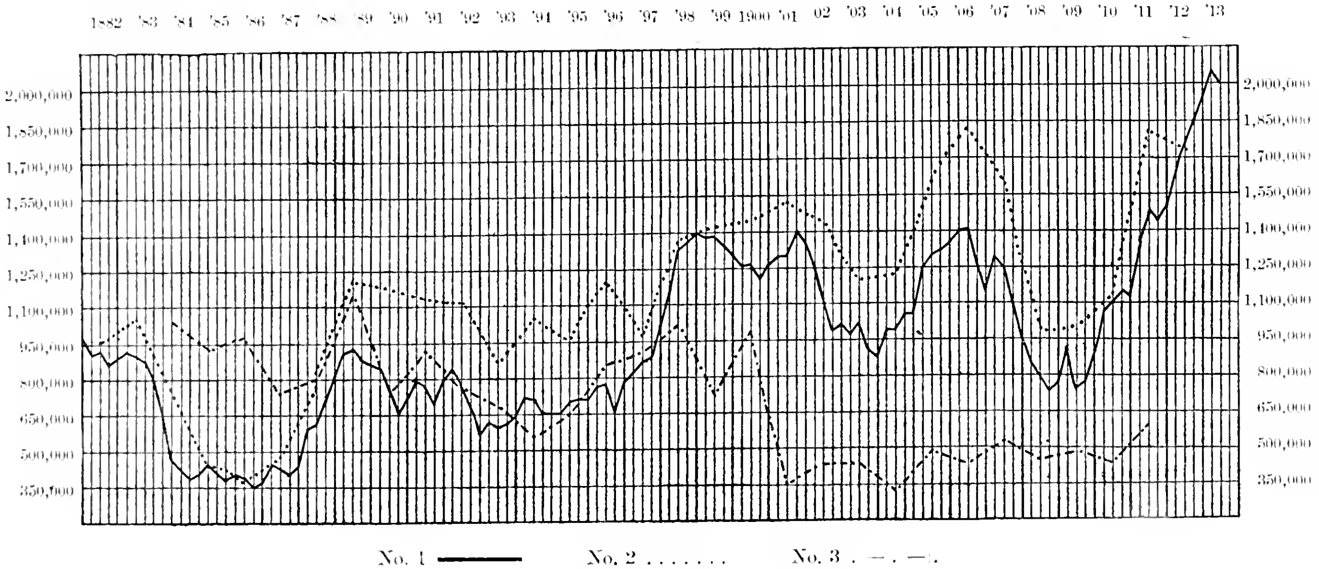
[29] *Cf.* article on oil-supplies of Canada, *Daily Chronicle*, July 17, 1913.

[30] *Cf. Enc. Brit.*, Article Petroleum.

TABLE I.

	Pig-iron production.	Coal production.	Pig-iron prices.	Coal prices.
	Million tons.	Million tons.	B. of T. indices.	B. of T. indices.
1868.......	5·0	103	....	....
'69.......	5·4	107	....	..
1870........	6·0	110	....	....
'71.......	6·6	117	72·1	58·3
'72	6·7	123	119·7	93·9
'73........	6·6	127	148·0	124·0
'74.......	6·0	125	111·9	102·8
'75.......	6·4	132	86·3	79·3
'76........	6·6	133	74·2	65·4
'77.......	6·6	135	68·2	60·8
'78.......	6·4	133	63·7	56·6
'79...	6·0	134	61. 3	52. 2
1880........	7·7	147	76·1	53·0
'81........	8·1	154	65·8	53·5
'82........	8·6	156	66·8	54·4
'83.......	8·5	164	61·8	55·7
'84	7·8	161	54·7	55·6
'85.......	7·4	159	51·3	53·5
'86........	7·0	157	50·6	50·4
'87.......	7·6	162	54·9	49·6
'88.......	8·0	170	50·4	50·1
'89.......	8·3	177	59·5	60·9
1890.......	7·9	182	72·6	75·0
'91.......	7·4	185	62·4	72·4
'92.......	6·7	182 ·	61·2	65·9
'93.......	7·0	164	55·7	59·1
'94........	7·4	188	54·6	63·0
'95...	7·7	190	56·9	55·8
'96........	8·7	195	56·7	52·8
'97........	8·8	202	57·3	53·4
'98........	8·6	202	62·5	59·3
'99.......	9·4	220	82·6	63·7
1900........	9·0	225	100·0	100·0
'01........	7·9	219	74·6	83·1
'02........	8·7	227	77·1	73·8
'03........	8·9	230	75·1	70·1
'04........	8·7	232	69·6	66·7
'05........	9·6	236	75·0	63·4
'06........	10·2	251	83·2	65·5
'07.......	10·1	268	88·2	76·5
'08........	9·1	262	75·3	76·5
'09........	9·5	264	76·9	67·8
1910........	10·0	264	81·2	70·4
'11.......	9·5	272	76·2	68·5

TABLE II.



Explanation.

1. Gross tonnage under construction at end of quarter } Scale as at
2. Gross tonnage launched in year* } side.
3. Grain freights, New York to London, Board of Trade Index, Cd–2337 of 1904; figures from New York Produce Exchange. The figures are in *Stat. Abs. U.S.A.*, whence I have calculated the index since 1903. Scale, 1,000,000 = 100. Base year, 1900.

* From 1882 to 1888 only that classed by *Lloyd's Rejister*, estimated at 85 to 90 per cent. of the whole.

TABLE III.

	Average profit or loss per company.	Net increase in spindles.		Average profit or loss per company.	Net increase in spindles.
	£	Millions.		£	Millions.
1884	+2,081	1·0	1899	+ 4,288	0·3
'85	− 31	0·0	1900	+ 4,190	0·4
'86	− 686	−0·3	'01	+ 3,494	0·5
'87	+ 966	0·04	'02	− 16	0·9
'88	+2,925	0·0	'03	− 503	0·0
'89	+2,565	0·76	'04	+ 352	0·5
1890	+4,220	0·25	'05	+ 7,701	1·0
'91	+ 383	1·0	'06	+ 6,555	1·5
'92	− 957	0·6	'07	+13.211	2·0
'93	− 605	−0·08	'08	+ 5,865	2·6
'94	+ 46	0·0	'09	− 2,720	1·0
'95	+ 589	0·13	1910	− 3,680	0·4
'96	+ 533	−0·5	'11	+ 288	0·5
'97	+1,680	0·0	'12	+ 960	0·25
'98	+3,156	0·0			

TABLE IV.

	Brazilian coffee crop.	Brazilian jute-yarn imports from United Kingdom.		Brazilian coffee crop.	Brazilian jute-yarn imports from United Kingdom.
	Thousand bags.	Million lbs.		Thousand bags.	Million lbs.
1896	....	16·5	1906	10,277	31·3
'97	....	23·5	'07	19,663	35·0
'98	....	21·4	'08	10,304	24·2
'99	....	20·3	'09	12.419	21·9
1900	8,971	21·1	1910	14,944	25·6
'01	10,250	28·0	'11	10,548	22·0
'02	15,496	31·8	'12	12.464	22·6
'03	12,324	28·0	'13	10,750	....
'04	10.407	21·3	'14	? 12,500	....
'05	9,973	24·7			

TABLE V.

	New railway mileage.		New railway mileage.		New railway mileage.		New railway mileage.
1846	595	1856	427	1866	565	1876	208
'47	909	'57	387	'67	393	'77	205
'48	1,182	'58	448	'68	449*	'78	256
'49	904	'59	460	'69	449*	'79	363
'50	590	1860	431	1870	392	1880	237
1851	....	'61	436	'71	39	'81	242
'52	....	'62	692	'72	238	'82	282
'53	....	'63	771	'73	268	'83	224
'54	368	'64	467	'74	366	'84	183
'55	226	'65	500	'75	216	'85	....

* Average.

TABLE VI.

	On register, January 1.	Broken-up, wrecked, &c.	Sold foreign, &c.	Total diminution.
	Gross tons.	Gross tons.	Gross tons.	
1887	9,814,984	335,768	147,593	483,361
'88	9,818,674	297,996	166,896	464,892
'89	10,104,370	244,056	181,800	425,856
1890	10,660,362	311,229	190.332	501,561
'91	11.150,406	327,832	161,573	489,405
'92	11,660,093	292,877	141,663	434,540
'93	12,203,761	266,820	247,668	514,488
'94	12,489,988	307,971	262,033	570.004
'95	12,831,221	305,452	403,620	709,072
'96	12,968,746	316.853	372,786	689,639
'97	13,144,213	327,205	450,139	777,344
'98	13,155,626	302,441	629,082	931,528
'99	13,368,853	261,956	633,879	895,835
1900	13,760,495	265,937	669,118	935,055
'01	14,032,694	238,276	409,272	647,548
'02	14,635,197	189,640	316,515	506,155
'03	15,351,203	261,866	364,556	626,422
'04	15,773,981	247,852	362,798	610,650
'05	16,281,815	248,470	616,048	864,518
'06	16,680,985	240,904	492,664	732,968
'07	17,462,976	237,770	422,474	660,244
'08	18,076,806	279,911	265,473	545,384
'09	18,233,410	267,942	406,830	674,772
1910	18,402,725	365,251	592,399	957,650
'11	18,461,370	246,902	771,132	1,018,034
'12	18,807,112	352,194	742,882	1,095,076
Total ..	368,653,066	....	....	17,246,351

TABLE VII.—*Proportion of vessels, removed for foreign transfer in each year, built before*

	1885.	1890.	1895.	1900.	1905.
1896....	75	....	....	....	....
'97....	70	....	....	....	....
'98....	50	$66\frac{2}{3}$	....	....	....
'99....	50	60	....	....	....
1900....	38	55	....	....	....
'01....	49	57	....	....	....
'02....	45	58	....	....	....
'03....	59	71	....	....	....
'04....	35	55	80	....	....
'05....	43	62	78	$90\frac{3}{5}$	....
'06....	36	48	65	80	93
'07....	31	51	67	78	90
'08 ..	36	50	65	75	83
'09....	27	47	72	$81\frac{1}{2}$	?
1910....	19	$33\frac{1}{3}$	$73\frac{1}{2}$	$85\frac{1}{2}$	95
'11....	14	$29\frac{1}{2}$	59	81	91
'12....	11	$25\frac{3}{5}$	47	$65\frac{7}{10}$	$83\frac{7}{10}$

TABLE VIII.—*Petroleum output.*

	U.S.A.	Russia.	Dutch Indies.	Galicia.	Roumania.	India.	Mexico.	World's total.
1899	7·2	8·3	....	·3	....	·1	....	16·8
1900	7·5	9·8	....	·3	·4	·2	....	18·6
'01	8·8	? +	·1	·4	·3	·2	....	19·9
'02	11·2	? +	·5	·5	·3	·2	....	22·9
'03	12·8	9·8	2·0	·7	·4	·4	....	26·2
'04	14·9	10	·9	·8	·5	·5	....	28·0
'05	17·1	7·5	1·1	·8	·6	·6	....	27·0
	19·0							29·9
'06	17·9	8·2	1·2	·7	·6	·6	....	29·8
'07	23·3	8·4	2·2	1·2	1·1	·6	·3	36·4
'08	24·4	7·7	2·3	1·8	1·1	·6	·6	38·7
'09	24·4	8·0	1·5	2·1	1·3	·9	·4	39·2
'10	28·3	9·0	1·7	1·7	1·4	·9	·5	44·2
'11	29·0	8·3	1·6	1·3	1·5	1·0	·9	44·7
'12	....	....	...	....	....	....	....	....

Note.—The estimates since 1905 inclusive are from *The Mineral Industry*, edited by Charles Of, New York, 1911, p. 557; for earlier years they are those of the *Annual British reports on mines and quarries.* (Figures in millions of long tons.)

TABLE VIIIA.—*Production of Pennsylvania, &c. (in barrels).*

1902	32·0 m.	1905	29·5 m.
'03	29·9 ,,	'06	28·3 ,,
'04	31·4 ,, ·		

DISCUSSION *on* MR. ROBERTSON'S PAPER.

MR. D. A. THOMAS said the Paper had been an exceedingly interesting and suggestive one. There were one or two corrections he wished to make from a coal point of view, in regard to the period of gestation. The author seemed to think it was longer now than it was a few years ago. No doubt the pits sunk to-day were deeper and required more capital; but, on the other hand, owing to the great improvements in the methods and appliances for pit sinking, he would say that a pit could be sunk to-day and be got ready to produce coal in remunerative quantities in a shorter period than was the case a generation ago. A pair of 20-feet pits in South Wales could be sunk 500 yards in normal circumstances—that was, if it did not meet with exceptional difficulties—and be opened out to produce sufficient work to make capital remunerative in three years' time. The author had referred to the lessened production of the year 1908, and seemed to think that rather upset his theory of a five years' period of gestation. He may have overlooked the fact, which might be the explanation of it, that in South Wales there was a prolonged strike at the great majority of the collieries for four or five months, which would fully account for the shortage, notwithstanding the stimulation of higher prices. The author had given too flattering a description of a Paper which he (the speaker) had read before the Society some ten years ago, and had said that he thought the estimate he (the speaker) had made had been falsified by the subsequent course of prices and production. He had no doubt that many opinions expressed and estimates he had made ten years ago required revision now; but he had looked up the Paper to see what he did say in this particular instance, and he had found that it was not an estimate but a statement of fact as to what happened three years before that he had made, and in that statement he thought he was right. The period of gestation, as it bore upon industrial cycles of trade, was only one factor out of many perhaps more important, and constantly varying factors. In that connection he pointed out that really the experience of the history of ten or twenty years ago was only a very small guide to what they might expect in the future. For instance, in the South Wales coalfield, with which he was more particularly associated, during the last five years, between 1907 and 1912, there had been no increase in production at all. That had nothing to do with the period of gestation of colliery enterprise, but was due to a new though normal condition of things in recent years—the recurrence of labour troubles. Up to 1907, there had been a very great increase both in the exports of coal abroad, and in the production of coal. The potential producing capacity of the pits in South Wales was very much in excess of the actual, and there need be no fear that they had reached the culminating point in the South Wales coal trade. Another factor bearing upon the future course of events was the amount of legislation that had been passed during the past five years, some good, much of it merely hampering. He was confining himself to the coal trade, a matter on which perhaps he could speak with some degree of authority. The writer, in considering the periodical fluctuations, must not overlook the fact that trades unions were very much stronger and exercised a very much greater influence now than they did some years ago, and that their policy and influence were in most cases restrictive in the matter of production. Then another factor which had to be borne in mind was, that as prices rose and wages rose—and this was human nature experienced in every walk of life—the better off men were, and the more easily they could obtain the means of subsistence, the less energy was put forward; there was a very considerable diminution in the output per man per annum. On the other hand, when prices fell, and wages followed, the fact that the men worked harder accentuated the depression which followed from the number of mines opened during the period of boom. In the writer's tables he had taken the annual production and the annual prices. He (the speaker) suggested that if he were going to deal scientifically with and go further into this matter, he would have to take a more sensitive barometer than the annual one. He would have to take it month by month if he wished to arrive at any scientific correlation between production and prices. Finally, he pointed out that the history of the coal trade during the past couple of generations had been one of long periods of depression followed by comparatively short periods, he would not say of inflated prices, but of higher prices. His view was that in future the period of trade cycles would be shorter. That had been the experience of the last ten years. Within that period they had had two periods of good trade in coal, and two periods of high prices in commodities generally. The writer had only suggested that the period of gestation was one important factor in the matter of prices and production; he did not think he had suggested for one moment that it was by any means the most important. The reason he ventured to make the prediction that in future the period of trade cycles would be shorter and the fluctuations less wide was because of the greater facilities of inter-communication all the world over, and because of the wider knowledge of trade in its broader aspects possessed by bankers and others engaged in industry and commerce. All this tended in a sense to bring distant countries more nearly together. He referred to the enormous strides which had been made during the last fifty years. Steamers had taken the place of sailing vessels, and could do half-a-dozen voyages in the time a sailing vessel would do one. Not only was there daily telegraphic communication in the place of written correspondence that often took weeks, but there was also hourly telephonic communication, and. men could now do business in a mere fraction of the time that it formerly required. He was strongly of the view that those factors must result in shorter periods of trade fluctuations, and tend to lower the peaks in the commercial diagram.

Mr. R. G. HAWTREY said that, as throwing light on certain consequences of trade fluctuations, he thought the statistics that Mr. Robertson had examined were very important. It did not seem to him that the particular matters Mr. Robertson had dealt with could be said to have very much to do with the *origination* of the movements he was examining. The subject of the Paper really fell into two parts. There was what the author called the influence of the period of gestation of new capital, and there was the period of replacement of capital. With regard to the first, he could not help thinking that Mr. Robertson had laid a little too much stress on the precise period occupied by the creation of new capital. It might be that the average period of opening a new coal mine was five years, but he thought it was laying too much stress on the average to suppose that the effect of a period of high prices was practically concentrated in a year just five years afterwards. Presumably the actual period for different enterprises would vary very widely. Indeed, Mr. Robertson had pointed out that there was one enterprise started in 1900 as to which the period of gestation was twelve years, inasmuch as it was hardly beginning in 1912. Secondly, it seemed to him, even if they could suppose that the greater part of the new enterprises started in response to high prices in one year were concentrated in their effects in a comparatively short period at a definite interval afterwards, still the effect of the new capital coming into use on production was probably very small. He thought the author had made an insufficient allowance for the practice of working short time, by which, it might be, they increased the amount of capital in use in a particular year by 5 per cent., and yet decreased production, by working on short time, by 20, 30, or 40 per cent. Whatever the amount of capital in use, the amount of production in any year would be regulated by the price in that year. The amount produced would only exceed by a very limited proportion the amount which could be absorbed by the demand at a price which would at any rate cover the cost of working before they came to the question of profit on the new capital or the old capital. He could not help thinking that the question of the restriction of output would very seriously affect the value of Mr. Robertson's statistics under the head of Period of Gestation. With regard to the second point, he thought the objection to laying too much stress on what Mr. Robertson called the harmonics of a period of high prices or of expansion of trade was still greater. It might be that the average time which steel rails lasted was ten years, but if the amount of railway construction increased, say, from 600 to 800 miles in a particular year, it was pressing that point very much too far to say there would be a marked increase in the production of steel rails ten years afterwards. Some would wear out seven or eight years afterwards, and some fifteen years afterwards. He would have thought, considering how limited fluctuations in railway construction had been, that the effect on the demand for steel rails at that particular period would be absolutely negligible. A minor point had occurred to him with regard to the stationary production of coal and pig-iron in 1898. Mr. Thomas had referred to it, and mentioned the strike in the Welsh coalfield. There was also the engineering strike of 1897; which must have had a very serious effect on the state of all dependent industries; and in fact he thought the general statistics of the state of trade showed there was a marked expansion in 1896 and quite a drop in 1897 and 1898. He thought everything pointed to the fact that labour troubles about that year had a really serious effect, so long as they lasted, on the state of trade, and that the state of trade recovered as soon as they were over, and the boom of 1899 and 1900 began at once.

Mr. FLUX said that Mr. Robertson's Paper was one of the most suggestive papers on that subject he had come across for a long while. So far as the ideas of the Paper were concerned, they seemed to him more important perhaps than the statistical verification which accompanied them. He saw that Mr. Robertson entirely agreed with him in that. The statistics available were rather defective. Mr. Thomas had pointed out one particular defect; but so far as iron and coal were concerned, it was not likely that for a good while, if ever, weekly or monthly statistics of output would be available for this country. Of course it was impossible for them to follow minutely the generation and development of those fluctuations, if they could only get averages of twelve months and those arbitrarily limited by the calendar and not really related at all to the actual course of the movements that were being traced. There were sundry other difficulties about the statistics, to some of which reference had been made already, and he would refer only to one, connected with the statistics of pig-iron production. Reference had been made to the proportion of furnaces in blast on the average. In that case they had statistics of furnaces in blast at a fixed date, namely, the end of the month, so that the figures given were not quite the averages in blast for the year. The relation of the two sets of figures, furnaces in existence and furnaces in blast, was not quite what appeared on the surface. In the case of furnaces in existence, it seemed not improbable that there might be quite a number that did not contribute anything substantial to the annual production, though some of these might be brought into use under extreme pressure. Possibly some difference in that respect between America and this country, rather than a difference in the size of the furnaces and the capital rendered idle by their being stopped, might underlie the difference between those countries to which Mr. Robertson had drawn attention. There was one point on which light was thrown in the Census of Production Report regarding furnaces and their output. In answer to a voluntary question put to ironmakers, regarding the actual output of their furnaces for the year and the capacity of those furnaces, particulars were obtained which showed the actual output to be 74 per cent. of the maximum capacity, the difference being due to the same general causes which were reflected in the two columns in Mr. Robertson's table. Of the total number of furnaces to which these particulars related, 77 per cent. were in blast on the average. But he would like to lay some stress upon the fact that furnaces were damped down for the purpose of repairs from time to time, and that was necessary whether the furnace was a big one or a little one; therefore, necessarily, a certain proportion of the twelve months was lost. The proportion of furnaces actually operating to the maximum that would be operating if there were continuous full prosperity in the trade was the kind of thing they wanted but could not get; the proportion of those in blast to those in existence was but an imperfect measure of this.

The President said he was disposed to agree with the last speaker, that the ideas presented by Mr. Robertson were particularly important. The Paper afforded remarkably good illustrations of that fundamental distinction between long periods and short periods which Dr. Marshall had first of all pointed out clearly. It was only in long periods the correspondence between value and investment in effort and sacrifice made itself felt. During short periods quite a different law prevailed. As he listened to Mr. Robertson's able composition, Marshall's conception of quasi-rent had often occurred to him. Quasi-rent prevailed during short periods; and thus the case of a house was a particularly strong one, as Mr. Robertson had intimated. The speculative builder who was induced, in the hope of profit, to build a house, must for a long time bear whatever burden or take whatever advantage might accrue to him. During a relatively short, though absolutely long, period he was at the mercy, for instance, of taxation; a tax of rent fell wholly on the landlord. This was equally true of quasi-rent during a short period. The unfortunate owner must make the best of his bargain and bear the tax imposed. But the increasingly fashionable practice of imposing taxes on land was sometimes not accompanied by the consideration that that theory was not true of long periods. If they taxed those people who were expecting profits in long periods, they discouraged other people from investing. In long periods the Ricardian theory asserted itself, and production was checked. In fact he might almost define a Socialist, in the bad sense of the term, as one who did not understand the difference between quasi-rent and true rent.

Mr. Robertson, in reply, agreed that the idea was the most valuable thing in the Paper, and that belonged partly to M. Aftalion and partly, he thought, to Mr. Yule, who first suggested it to him. He thanked Mr. Thomas particularly for the very gentle way in which he had treated one whose practical ignorance of the subject on which he was writing was very obvious. He was sorry he had misrepresented Mr. Thomas; but what he had gathered from Mr. Thomas's Paper was, that investment had not been very great during the 1900 boom, and he found it difficult to reconcile that with the very slow response of coal prices in the following boom of 1906, and with the large increase in production, and he wondered whether, after all, there had not been a good deal of investment in the 1900 boom. With regard to Mr. Hawtrey's remarks, he (the author) was assuming that the average period in both cases corresponded with the most frequent period—that the average corresponded with the mode and that the distribution about the mode was not very widely dispersed. He thought that was perhaps a legitimate assumption. Perhaps Mr. Hawtrey had rather overstated the case when he attributed to him the supposition that every small increase in railway building would form a very large echo ten years later. It was only in the case of very large expansion such as that of the 'forties one would expect to find a considerable echo ten years later.

On the DETERMINATION *of* SIZE *of* FAMILY *and of the* DISTRIBUTION *of* CHARACTERS *in* ORDER *of* BIRTH *from* SAMPLES *taken through* MEMBERS *of the* SIBSHIPS.

By M. GREENWOOD, Junr., *and* G. UDNY YULE.

[Read before the Royal Statistical Society, December 16, 1913, the President, Professor F. Y. EDGEWORTH, M.A., F.B.A., in the Chair.]

IN his *First Study of the Statistics of Pulmonary Tuberculosis*[*] Professor Karl Pearson reached the conclusions: (1) that there was no reduced fertility in the case of tuberculous stocks, "in "fact their fertility is as great as that of any other class in the "community"; and (2) that "the elder offspring, especially the "first and second, appear subject to tuberculosis at a very much "higher rate than the younger members." Dr. David Heron, in a memoir on the inheritance of the insane diathesis,[*] reached similar conclusions as regards insane stocks and the incidence of insanity, and Dr. Goring as regards criminality.[†] The importance of these conclusions was emphasised by Professor Pearson in the Robert Boyle Lecture for 1907.[‡] The results have, however, been impugned by, among others, Weinberg, Macaulay and Ploetz,[§] upon various grounds, and their importance justifies a further examination of the methods by which they have been obtained. In the opinion of the present writers certain of these are open to serious theoretical objections, and the aim of the present communication is to summarise the conclusions they have been led to form and to give statistical illustrations of the effect produced by the introduction of modifications which seem to them necessary. Certain of our results have already been obtained and published in different notation by Weinberg, whose latest publication only appeared after the notes upon which this Paper is based had been written. The Paper is divided into two parts. In the first we deal with the problem of size of family; and in the second with that of birth number. As will be pointed out, some possible sources of fallacy have been necessarily omitted from our discussion.

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[*] Dulau and Co., 1907.

[†] *The English Convict.* Wyman and Sons, 1913. Some data given by Professor Pearson in the Boyle Lecture, 1907.

[‡] Henry Frowde, 1907; also reprinted as Eugenics Laboratory Lecture Series. No. 1, 1909.

[§] Weinberg, W., "Die rassenhygienische Bedeutung der Fruchtbarkeit," *Arch. f. Rassen. u. Gesellschafts Biologie*, 1910, vol. vii. p. 684.: "Zur Frage der Messung der Fruchtbarkeit," *ibid.*, 1913, vol. x, p. 162. Ploetz, A., "Neomalthusianismus und Rassenhygiene," *ibid.*, 1913, vol. x, p. 166. Macaulay, T. B., *The Supposed Inferiority of First and Second-Born Members of Families—Statistical Fallacies.* (Herald Press, Montreal, 1912.)

Fertility of defective or other selected stocks.

The problem to be solved is the following:—Certain individuals are selected out of the general population as "marked," *i.e.*, entered on some record, say, as diseased or otherwise noteworthy, and the size of their "sibships" (the number of brothers and sisters, including the marked individual) is recorded. Required to find the relation between: (1) the mean size of the family (sibship) in the population at large, say, M_0; (2) the mean size of sibships showing one marked individual at least (marked sibships). Here two distinct cases must be distinguished, according as—(*a*) each marked sibship has been entered only once, whatever the number of marked individuals it contains; or (*b*) each marked sibship has been entered once for each marked individual therein, as, for instance, might happen if names were not noted and some of the marked individuals were brothers. The means of marked sibships in these two cases may be denoted by M_1 and M'_1.

In the population from which the data are drawn let the number of families (sibships) with x members be f_x, then evidently the mean size of sibship in this population is given by

$$M_0 = \Sigma(xf_x)/\Sigma(f_x) \qquad (1)$$

As regards the marked sibships, take first case (*a*) and suppose that every sibship with a marked member is recorded once, and only once. Let p be the probability of an individual being marked, and let $q = 1 - p$. Further, for the sake of simplicity, suppose that the marking of a second individual in the sibship is independent of the marking of the first. Here we may be diverging from fact if the marking is a strongly inherited character or an infectious disease, or if the mere entering on the record of one member of a sibship increases the chance of the entry on the record of another. Let us also suppose that the marking of the individual is independent of his place in order of birth or of the size of the sibship. Then q^x is the chance of a sibship of x members not possessing a marked member, and consequently of the f_x sibships of x members in the population only $f_x(1-q^x)$ will appear in the record as marked sibships, each once only. Hence the mean size of marked sibship is

$$M_1 = \Sigma[xf_x(1-q^x)]/\Sigma[f_x(1-q^x)] \qquad (2)$$

As q is less than unity, $1-q^x$ increases with x. That is to say, the larger families are weighted the more heavily, and consequently M_1 is necessarily greater than M_0, except at the limit, when $p = 1$. If p approaches unity, q approaches zero and M_1 approximates to M_0. If, on the other hand, p is very small, q approximates to unity and $1-q^x$ to px, and every sibship is weighted approximately in proportion to its size. Given, in this case, the numbers of marked sibships of 1, 2, 3, . . . members, a fair comparison with the general population will be obtained by the simple process of dividing the number of sibships of two members by 2, the number of sibships of three members by 3, and so on.*

If, finally, every sibship is entered once for each marked member, the f_x families of x will, on the average, be counted pxf_x times, as they will contain on the average pxf_x marked members. The mean size of sibship is therefore

$$M_1' = \Sigma(x^2 f_x)/\Sigma(xf_x) \qquad (3)$$

M'_1 is greater than M_1, except at the limit, when $p = 0$, $q = 1$. For a very rare character, therefore, it will make no practical difference whether we enter each sibship once only, or once for each marked member it contains.† This seems a reasonable conclusion, for if p be very small it is unlikely that there will be more than one marked member in any sibship, provided marking be really random. As already pointed out, for highly inherited characters or infectious diseases, even if rare, or if data are so collected that the mere *recording* of one member of a sibship increases the chance of *recording* another, the formulæ cannot strictly hold good, and can only be used as approximations. It must also be remembered in interpreting the formulæ that p is not merely, say, the chance of a given individual *being* insane, but the chance of his *being entered on the given record* as insane, the chance of the second event being much smaller than that of the first. The magnitude of the error likely to be made owing to the biased nature of the sampling may readily be estimated by transforming equation (3). If σ be the standard deviation of size of family in the population from which the data have been drawn, v the ratio of standard deviation to mean, we have*

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* Applying this process to the last column of the table for New South Wales on p. 184, the size of family deduced is 7·08, very close to the true value of 7·098.

† In the first of the two Papers by Weinberg cited above the value given in equation (3) of the text is obtained. In a Paper by one of us and Brown (Greenwood and Brown, "An examination of some factors influencing the rate "of infant mortality," *Journ. Hygiene*, 1912, vol. xii, p. 1) it is pointed out that Weinberg's expression does not apply to Pearson's and Heron's cases, since the sibships were apparently only counted once for each marked member. Although this criticism was theoretically just, as since admitted by Weinberg, the latter is correct in stating that the difference between the results of the two methods is of little importance in the instances under consideration. The criticism in Greenwood and Brown's Paper was, therefore, too absolutely expressed.

$$M_1' = \frac{M_0^2 + \sigma^2}{M_0}$$
$$= M_0(1 + v^2).$$

Now v for size of family ranges from 0·5 to 0·7 or thereabouts. We may well expect, then, in collecting data by the method supposed, when p is small, to exaggerate the true mean size of sibship by 25 to 50 per cent.

As a matter of practice, then, it seems impossible to avoid bias if the size of families be recorded by selecting individuals and noting the numbers of their brothers and sisters, and we are a good deal puzzled to understand how this source of error, which Professor Pearson† was himself the first or one of the first to point out, came to be overlooked, or indeed denied to have any effect, in the present instance. Dr. Heron specifically considers the question of weighting, owing to the method by which the record has been made, and concludes that "this source of disturbance has no existence in our "data if we confine our attention to distinct family histories and not "to distinct insane individuals, the patient being the member of the "sibship for whom the record was originally made." We are unable to agree with this conclusion or with Dr. Heron's algebra in support thereof. Dr. Heron writes, taking a population of MN individuals of whom M are marked: "Analytically we can "proceed as follows: taking the f_s families of s, there will be f_s/N "tainted families and $f_s(1-1/N)$ untainted. The chance that no one "member of a family of s members should be tainted is clearly "$f_s(1-1/N)^s$, or the number of tainted members would be "$f_s(1-(1-1/N)^s)$. In other words, this family would be reckoned "this number of times, if we simply inquired as to size of family of "each patient without investigating how far the patients were "siblings" (Heron, *op. cit.*, p. 29).

In our opinion—

(1.) The number of tainted families is not f_s/N, but $f_s(1-(1-1/N)^s)$.

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* Pearson, Lee and Moore "On Genetic Selection," *Phil. Trans.*, vol. cxcii A, 1899, equation (1), p. 262.

† *Loc. cit.* in preceding note. Several others have pointed out the source of error since.

(2.) The chance that no member of a family of s members should be tainted is $(1-1/N)^s$, not this expression multiplied by f_s.

(3.) $f_s(1-(1-1/N)^s)$ is not the number of tainted members, but the number of families of s which contain one or more tainted members. In other words, it is not the number of times that families of s would be counted if we simply inquired as to size of family of each patient without investigating how far the patients were siblings, but the number of times that families of s would be entered if we counted each family only once, however many affected members it contained.

It seems clear to us that if the character is a rare one, or if the sample is small compared with the whole population, so that p is very small, the frequency of families of size x should be divided by x to obtain a distribution comparable with that of the general population or with the approximately unbiased distribution obtained by selecting *parents* and recording the number of their offspring.

As a matter of practice we do not know the frequencies f_x of sibships of a given size in the population at large, but are given the biased frequencies $f_x(1-q^x)$ or xf_x. To obtain an indication of the amount of bias it seems best to correct these by assuming some value of q and dividing by $1-q^x$, or, in the latter case, dividing each frequency simply by x. In this way we shall arrive at corrected means M_0' or M_0'' given by the following equations, in which F_x, F_x', denote the biased frequencies, *i.e.*, the frequencies of marked sibships in the record:—

$$M_0' = \Sigma[xF_x]/(1 - q^x)]/\Sigma[F_x/(1 - q^x)] \qquad (4)$$

$$M_0'' = \Sigma(F_x')/\Sigma(F_x'/x) \qquad (5)$$

The "corrected mean" will represent, so far as we can truly estimate it, the value that the mean sibship would have if the record could be freed (1) from the bias due to its being the record of a small sample (and not of the whole population), a large sibship being therefore more likely to be represented in it than is a small one; (2) from the bias due to the character recorded being more or less rare, and therefore more likely to occur in a large sibship than in a small one. If the character recorded be a very common one the first will be the more important source of bias. If it be a rare one, both will operate largely.* If the character be one that *must* occur, the first source of error is still sufficient to render heavily biased all data as to sizes of sibships collected in this way through members of the sibships themselves. If, for example, we collect data as to sizes of sibships in the population at large, not specifying any special mark or character, by asking individuals as to the number of their brothers and sisters, the mean found for a sample that is small compared with the population as a whole will be practically the M_I' of equation (3), and to make the figure comparable with that which would be given by a complete census of all sibships the corrected mean should be found by (5).

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* See Weinberg's recent paper, cited above; and also Gini, *I fattori demografici dell' evoluzione delle nazioni*, 1912 (footnote, p. 29).

The accompanying table illustrates the wide difference between (*a*) the mean size of family deduced from a complete census; and (*b*) the mean size of family deduced from even fairly large samples, taken through a member of the fraternity, when the figures are simply averaged:—

NEW SOUTH WALES. *Fertile marriages.* [Data from Powys, *Biom.* iv, 250.]

Number of children.	Number of families.	Calculated number of families producing 1 or more affected members.	
		10 per cent. affected.	1,000 persons (·16 per cent.) affected.
1	3,309	330·90	5·41
2	4,079	775·01	13·33
3	5,416	1,467·74	26·53
4	6,909	2,376·01	45·08
5	8,273	3,387·79	67·43
6	9,551	4,475·60	93·34
7	10,022	5,228·48	114·17
8	9,907	5,642·04	128·88
9	8,420	5,158·09	123·12
10	7,260	4,728·44	117·87
11	5,076	3,483·15	90·57
12	3,550	2,547·48	69·05
13	2,078	1,549·77	43·75
14	1,171	903·08	24·65
15	591	469·31	14·33
16	283	230·56	7·32
17	119	99·15	3·27
18	67	56·94	1·95
19	32	27·68	0·98
20	10	8·78	0·32
21	9	8·02	0·30
22	4	3·61	0·14
23	3	2·73	0·11
24	—	—	—
25	—	—	—
26	1	0·94	0·04
Average Family	7·098	8·174	8·575

Turning now to practical illustrations of the effect of this correction, we took first Dr. Heron's Table XXI showing the gross fertility distribution of 331 families or sibships "containing at "least one insane member." Dr. Heron has reckoned each family only once, and so equation (4) gives the correct arithmetic mean; but since q cannot be far from unity, we can use (5) as a first approximation. Before, however, working out the arithmetic, there was a difficulty to overcome, as Dr. Heron's table totals to 364, not 331. Comparison with a later table suggests that for 48 families of two we should read 18, and for 44 families of three, 41. With this amendment the total agrees with that given in his text, and the mean also agrees, viz., mean size of family as observed 5·97. Dividing each frequency by the number in the family and calculating M_0'', we find only 4·17, a value that probably represents more closely the fertility of insane stocks than the figure given by Dr. Heron, and is distinctly low compared with any of the figures for healthy stocks with which he makes comparisons. To find the magnitude of the effect produced if q be not taken equal to unity, the value of M_0'' has been found for $q = 0·9$, and is 4·54. This is almost certainly too high a value. On p. 31 of his Memoir (Table XXV) Dr. Heron gives another table showing numbers in each position of order of birth for insane stocks, and from this the frequencies of sibships of different sizes can be derived by differencing (see below, p. 187). For the 315 sibships of this table we find mean size of sibships as observed 6·06, corrected mean M_0'' 4·48. This is a higher figure than in the last case, and it is not obvious why the distribution should differ from the last so largely, as both are drawn from the same data, and, so far as appears, must refer in great part to the same sibships.

Taking next Professor Pearson's distribution for tuberculous stocks (Memoir cited, p. 19), the mean size of sibship as observed is 5·68. If q is assumed to be sensibly equal to unity the corrected mean M_0'' is 4·06; if q is assumed to be equal to 0·9, M_0' is 4·38. The number of stocks in Professor Pearson's tables is the same as the number (381) of diseased individuals, so that he must either have entered each family once for each marked member or have taken one marked member only from each family. We have failed to find in the Memoir any precise statement as to what was actually done. If the former were the proceeding (5) would apply, and the first figure (4·06) would be the true corrected mean; if the latter, 4·06 would be probably too low and 4·38 too high, in our opinion. In view of the smallness of the sample the real value of q must be extremely small.

Both Dr. Heron and Professor Pearson give some data also for the number of children of defective parents, but it is not clear how these were obtained. If they were obtained directly from insane (or tuberculous) parents they would be only biased in so far as number of children is a heritable character, and the coefficient of inheritance is very small. If, however, they were obtained through children in the asylums or sanatoria there would be just the same source of bias as in the present case. We do not gather how, in fact, the data were collected, but conjecture that they were in part, at least, if not entirely, taken through the children. So far as they go the figures are :—Dr. Heron : 87 cases, in 48 of which the father and 39 of which the mother was insane ; mean 5·18. Professor Pearson : both parents tuberculous, 3·50 ; one tuberculous, 5·42 ; neither tuberculous, 5·82. The giving of the last figure distinctly suggests that data were obtained through the children in the sanatoria, and are therefore biased. Although, then, these figures give a greater size of sibship, it does not follow that the estimates of 4 to 4·5 given above are incorrect.

Finally, we took the data in Dr. Goring's official volume on the English convict. In Table 111, p. 278, are given the frequencies of sibships of convicts, counting each sibship once apparently for each convict therein. This* gives a mean size of sibship 6·99. Dividing the frequency of each size of sibship by the number in that sibship the corrected mean M_0'' is only 4·64. On p. 297 is given another table, showing frequencies of completed families of different sizes for non-criminal parents, there being at least one criminal amongst the offspring. From the similarity of the frequencies we judge that the data are very nearly those of the former table. The mean given by Dr. Goring is 6·97 children ; the corrected mean M_0'' is 4·62. The mean is low compared with all the other figures given for comparison, into which the same source of bias does not seem to enter. So far as our judgment goes there seems to be no good reason for thinking that "criminals are the product of the "most prolific stocks in the community" (Goring, p. 297).

Apparent differential incidence of a character on the offspring in order of birth.

We may now proceed to the second part of our problem, the question of the alleged heavy incidence of defects on the earlier-born children. This conclusion has been arrived at by Professor Pearson and Dr. Heron through a comparison of the number of first, second, &c., born among the defectives with the number of first, second, &c., born in the sibships of which they are members. It seems to us that such a mode of comparison is essentially fallacious, and must necessarily lead to a conclusion that the incidence is heaviest on the earlier born, whatever the character that is dealt with, desirable or otherwise.

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* Correcting an apparent slip in tabulation. A convict entered as twenty-third in order of birth is ascribed to a family of 22 ; we have transferred the entry to families of 23. If the order of birth is in error and the size of family correct, this would, however, make little difference

In any population in which the number of sibships of x members is f_x, the number of rth born ($r \leq x$) contributed by those sibships is f_x; hence the proportion of rth born in the whole population is

$$ {}_0B_r = \Sigma_r^k(f_x)/\Sigma_1^k(xf_x) \qquad (6)$$

where k is the greatest size of sibship occurring.

Since ${}_0B_r$ is proportional to $\Sigma_r(f_x)$, it follows that the frequency distribution for sizes of family may be obtained from that for order of birth by differencing, the result used above, p. 185*.

The proportion of rth born in the marked sibships, on the other hand, is, if we count each sibship only once,

$$\begin{aligned} {}_sB_r &= \Sigma_r^k(F_x)/\Sigma_1^k(xF_x) \\ &= \Sigma_r^k[f_x(1-q^x)]/\Sigma_1^k[xf_x(1-q^x)] \end{aligned} \qquad (7)$$

Or if we count each sibship once for each marked member—

$$\begin{aligned} {}_sB_r' &= \Sigma_r^k(F_x')/\Sigma_1^k(xF_x') \\ &= \Sigma_r^k(xf_x)/\Sigma_1^k(x^2f_x) \end{aligned} \qquad (8)$$

If p approaches zero, (7) approaches (8) just as (2) approaches (3). In neither case does the proportion of rth born amongst the marked sibships approximate to the proportion of rth born in the population at large, but is too small for the earlier born, in consequence of the manner in which the larger sibships have been weighted.

As regards the marked *individuals*, two cases must again be distinguished. Either we may include only one individual from each marked sibship, or we may include all marked individuals, whether one or more, from each sibship. In the former case the f_x sibships of x members in the general population will, as before, contribute only $f_x(1-q^x)$ marked sibships, and from each of these only one marked individual will be taken. The number of rth born individuals from families of x ($r \leqq x$) will therefore be on an average $f_x(1-q^x)/x$, and the whole number of rth born individuals

$$\begin{aligned} {}_iB_r &= \Sigma_r^k[f_x(1-q^x)/x]/\Sigma_1^k[f_x(1-q^x)] \\ &= \Sigma_r^k(F_x/x)/\Sigma_1^k(F_x) \end{aligned} \qquad (9)$$

In the second case, taking in all marked individuals, including brothers and sisters, the f_x sibships of x contribute pxf_x marked individuals, of whom pf_x on the average are rth born, and the proportion of rth born in the whole group of individuals will therefore be—

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* There is some error in the table on p. 21 of Professor Pearson's tuberculosis Memoir, as this test fails. For 322 third in order of birth read 332.

$$\begin{aligned} {}_iB_r' &= \Sigma_r^l(f_x)/\Sigma_1^l(xf_x) \\ &= \Sigma_r^l(F'_x/x)/\Sigma_1^l(F_x') \end{aligned} \tag{10}$$

which is identical with the distribution in the population from which the data have been drawn.* If p approaches zero (9) and (10) become more and more nearly identical, and it ceases to be material whether we take only one marked member of each sibship or more than one. If p is nearly zero the proportions of rth born among marked individuals are, in any case, practically those in the population at large, assuming, of course, that the marking has no special association with order of birth, size of sibship, or with the marking of another member of the sibship.

But the proportion of rth born amongst the *sibships* of the marked individuals is *not* the same as in the population at large. It is less for small values of r. Hence if we compare the proportion of rth born amongst marked individuals with the proportion of rth born amongst their sibships we are making a fallacious comparison which must inevitably lead to an apparent incidence of the marking on the earlier born. How great the effect of the fallacy may be is readily seen by the same transformation as before, if we take the simplest case for comparison, viz., a comparison of ${}_iB_r'$ with ${}_sB_r'$. If M_0 denote, as before, the mean size of sibship in the general population, we have from (10), for the proportion of first-born amongst marked individuals ${}_iB_1' = 1/M_0$.

And similarly from (8), σ being again the standard deviation of size of sibship in the general population, the proportion of first-born in marked sibships is ${}_sB_1' = M_0/(M_0^2 + \sigma^2)$.

Hence

$$\frac{{}_iB_1'}{{}_sB_1'} = \frac{M_0^2 + \sigma^2}{M_0^2} \quad 1 + v^2$$

Where $v = \dfrac{\sigma}{M_0}$. For size of sibship v may range from about 0·5 to 0·7, and hence the excess of the proportion of firstborn amongst

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* It may be helpful to point out that in marked individuals derived from families of x the proportion of any birth number is—

$$\frac{f_x\left\{pq^{x-1} + (x-1)p^2q^{x-2} + \ldots\ldots\ \dfrac{(x-1)!}{(x-r)!\,(r-1)!}p^rq^{x-r}\ \ldots\right\}}{f_x\left\{xpq^{x-1} + x(x-1)p^2q^{x-2} + \ldots\ \dfrac{x\,.\,(x-1)!}{(x-r)!\,(r-1)!}p^r.\,q^{x-r}\ldots\right\}}$$

i.e., $\dfrac{1}{x}$, which is the proportion of any birth number up to x in families of x.

marked individuals over that subsisting amongst their sibships may well range from 25 to 50 per cent., the same magnitude of error as is found when we compare the mean size of family in the biased sample with the true mean in the population from which the sample was drawn.

As is seen from equations (7) and (9), or (8) and (10), if we so arrange our data that the number of sibships is equal to the number of marked individuals (either counting each sibship only once and taking only one marked individual from each sibship, or counting each sibship once for every marked individual in it), the true method of estimating the number of marked individuals to be expected in each position in order of birth is the following:—Divide the frequency of each size of sibship by the size of the sibship and then sum the table from the bottom upwards. The method is illustrated in the following table, showing Professor Pearson's data for tuberculous stocks.

Number of tuberculous persons of each position in order of birth (Pearson), and calculation of the numbers to be expected from the size of their sibships; together with the numbers (Pearson) that would be expected if the distribution were the same for individuals and sibships.

1 Size of sibship x (or order of birth for cols. 4 to 6).	2 Frequency f_x	3 f_x/x.	4 Expected number of each order of birth given by summing preceding column.	5 Actual number of tuberculous individuals of each order of birth.	6 Expected numbers given by Professor Pearson.
1	15	15	93·92	**113**	67·1
2	34	17	78·92	**79**	64·4
3	43	14·33	61·92	**41**	58·5
4	42	10·50	47·59	**52**	50·9
5	62	12·40	37·09	**39**	43·5
6	59	9·83	24·69	**18**	32·6
7	40	5·71	14·86	**18**	22·2
8	29	3·62	9·15	**9**	15·1
9	22	2·44	5·53	**3**	10·0
10	14	1·4	3·09	**3**	6·2
11	6	0·55	1·69	**3**	3·7
12	6	0·5	1·14	**1**	2·6
13	3	0·23	0·64	**1**	1·6
14	4	0·29	0·41	**1**	1·1
15	1	0·07	0·12	—	
16	—	—	0·05	—	1·6
17	—	—	0·05	—	
18	—	—	0·05	—	
19	—	—	0·05	—	
20	—	—	0·05	—	
21	—	—	0·05	—	
22	1	0·05	0·05	—	
Total	381	93·92	381·11	**381**	381·1

Col. 2 shows the frequency of sibships (with one member at least tuberculous) of the size given in col. 1. Dividing each frequency by the size of sibship we have the figures of col. 3. Adding these up step by step from the bottom the numbers of col. 4 are obtained, and are the numbers to be expected in each position of order of birth (reading the numbers of col. 1 now as positions in order of birth). The actual numbers observed are given in col. 5, and it will be seen that they only diverge at all heavily from the calculated numbers in the case of the first and third children, the excess in the first case being roughly 20 per cent., and the deficiency in the second case 34 per cent.

Professor Pearson used the χ^2 method for judging the goodness of fit of his calculated to the actual distribution. We have some doubt as to whether such an application of the method is strictly correct, as *both* distributions are subject to fluctuations of sampling, but have used it in view of the precedent, and of the fact that, in practice, the method appears to yield reasonably reliable indications as to the extent of agreement. We find $\chi^2 = 16 \cdot 22$ (grouping together orders of birth 13 and upwards) or $P = 0 \cdot 182$. That is to say, we might expect a worse agreement about once in six trials. No stress, then, could be laid on the differences observed, taking this table by itself. Professor Pearson's calculated figures, based on the distribution of order of birth amongst all members of the sibships, show an excess of first-born amounting to some 69 per cent., as against the excess of only 20 per cent. calculated on what appears to us to be the true basis.

Taking next Dr. Heron's data for the insane, the table shows the actual numbers of first-, second-born, etc., amongst the insane individuals, together with our calculated numbers and Dr. Heron's. In this case, however, we had some difficulty in deciding on the basis of the calculation. Dr. Heron gives 315 sibships and 468 insane individuals. On p. 22 he states that his 315 families contain 404 insane individuals only, so we are compelled to assume that his 315 sibships do not cover, in fact, all the material he has used for insane individuals. A table already cited, in fact (p. 26 of his Memoir), is based on 331 sibships, apparently the entire material available from the records (p. 14). If the number of individuals is greater than the number of sibships Dr. Heron must be comparing, it would seem, (10) with (7). As p is certainly very small this should make little difference, provided that the occurrence of one marked individual in a sibship were independent of the occurrence of another. This condition is not fulfilled, but in view of the uncertainty attaching to Dr. Heron's precise procedure we decided to calculate the expected numbers in each order of birth as before, simply raising the totals in the proportion of 468 to 315.* These are the figures given in the second column. The observed proportions are given in the third column, and Dr. Heron's "expected" numbers in the fourth. It will be seen that, while the actual figures show for the first-born an excess of some 40 per cent. over the "expected" number calculated on the assumption that the distribution should be the same for marked individuals as for their sibships, the excess is only some 3 per cent. when the "expected" number is calculated by what we believe to be the correct method. Taken as a whole the actual distribution shows no bias as compared with expectation. We find $\chi^2 = 9 \cdot 24$ and $P = 0 \cdot 682$, so that, roughly speaking, we should expect a worse fit twice in three trials.

Number of insane persons of each position in order of birth (Heron) and numbers to be expected, calculated from the size of their sibships: together with the numbers (Heron) that would be expected if the distribution were the same for individuals and for sibships.

1	2	3	4
Order of birth.	Expected frequency of each order of birth calculated from size of sibships.	Actual number of insane individuals of each order of birth.	Expected numbers given by Dr. Heron
1	104·4	108	77·3
2	89·5	80	74·8
3	79·1	78	71·4
4	58·3	71	61·1
5	47·2	41	53·7
6	32·9	33	41·9
7	23·8	19	32·9
8	15·1	14	22·8
9	8·0	13	13·5
10	4·7	5	8·6
11	2·8	3	5·4
12	1·7	2	3·4
13	0·6	1	1·2
Total	467·7	468	468·0

We now come to Dr. Goring's data respecting criminals (male convicts). Apparently these data had been in part compiled at the time when Professor Pearson's and Dr. Heron's Memoirs were written. They are mentioned cursorily by Dr. Heron, and in Professor Pearson's Robert Boyle Lecture a diagram is given representing the actual and calculated incidence of criminality in order of birth, as well as his own and Dr. Heron's results for tuberculosis and insanity. This diagram shows the number of first-born amongst criminals as slightly more than double the calculated number, the ratio being as nearly as we can read the small-scale figure 120 : 58. In Dr. Goring's recent volume, to which reference has already been made, numerical data are given. In this instance the correct method of deducing the expected numbers has been used, and the excess, as shown by the following table, is no longer 100 per cent. or more, but only some 25 per cent. Had the incorrect method been used the excess would have been about 87 per cent. We cannot but assume that in the earlier work the same method was used as employed by Professor Pearson and Dr. Heron, but no reference is made so far as we can trace to the discrepancy between the results. Nor apparently is the nature and the importance of the difference recognised. For, accompanying the diagram representing the results obtained for criminals on the correct method are given reproductions of the diagrams representing the corresponding results for tuberculosis and insanity obtained by the earlier, as we think, fallacious method. While Professor Pearson, however, concluded from his diagrams that "science has "a word to say with regard to reform of an hereditary peerage,"* Dr. Goring is doubtful whether the results for criminals have any important significance. From some other data—the failure of

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* In Dr. Heron's data the order of birth was given in the case of most members of the sibship. In Professor Pearson's records this information was confined to the sanatorium patients.

Number of criminals (males) in each position in order of birth (Goring) and numbers to be expected, calculated from the sizes of their sibships (Goring).

Order of birth.	Expected numbers calculated from sizes of sibships.	Actual number of criminals of each order of birth.
1	309·2	385
2	252·2	337
3	215·7	197
4	170·4	135
5	137·9	111
6	100·7	75
7	71·5	58
8	52·8	34
9	36·7	31
10	27·4	17
11	19·6	12
12............	14·0	13
13............	9·8	11
14............	6·3	6
15............	3·5	3
16............	2·5	4
17............	3·8	1
18............		2
19............		1
23............		1
Total	1,434·0	1,434

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* Robert Boyle Lecture, p. 13, footnote.

order of birth to show any significant correlation with frequency of conviction or length of imprisonment—he concludes that he " would "feel inclined to deduce that the selection of first- and second-born "for criminal conviction is only an appearance, due possibly to the "fact that the infant mortality of the later born in families is greater "than that of the earlier born,"* though he has no statistical evidence in support of the suggestion. Ansell† gave life-tables for children distinguished by order of birth, and though his data were drawn from the upper classes they may throw some light on this suggestion. Out of 1,000 children born alive, 836 of the first-born survive to age 15, 845 of the second-born, 847 of the third, 835 of the fourth, fifth and sixth together, and 813 of the seventh and following children; for all children together the figure is 834. This would seem to suggest a tendency to emphasize the second and third children rather than the first and second.‡ In Dr. Goring's table the second children are those most largely in excess, but the third are in defect. While Ansell's tables refer, however, to both sexes together, Dr. Goring's are based on males only. This would render them liable to be affected not only by differences of mortality, but also by any variation of the sex ratio with order of birth. Whatever the source of the divergence between the actual frequencies in order of birth and the expectations in this case may be, it is certainly " significant." We find $\chi^2 = 86 \cdot 4$, and this would give a very minute value for P with the first significant figure somewhere after the sixth decimal place.

We have also taken a set of data respecting imbecility given

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* *The English Convict*, p. 280, footnote.

† *Statistics of families*, 1874.

‡ Geissler, on the basis of 26,000 legitimate births in families of miners (Geissler, A., " Ueber den Einfluss der Säuglingssterblichkeit auf die eheliche "Fruchtbarkeit u.s.w.," *Zeitsch. d. Sächs. Stat. Bur.*, 1885, S. 23) finds that nfantile mortality rapidly increases after the fourth child. The figures are :—

Order of birth.	Infantile mortality per 100 births.	Order of birth.	Infantile mortality per 100 births.	Order of birth.	Infantile mortality per 100 births.	Order of birth.	Infantile mortality per 100 births.
1........	23	4........	23	7........	31	10........	41
2........	20	5........	26	8........	33	11........	51
3........	21	6........	29	9........	36	12........	60

Ploetz (*op. cit.*), in 3,300 children of royal families, found no difference until the ninth child. See further, p. 10 *infra*.

in the recent Memoir on the birth-rate by Professor Pearson and others* (Table LX). The annexed table gives the observed numbers in each position of order of birth, and the expected numbers calculated by ourselves. A comparison is not made in the Memoir, but it is stated (footnote, p. 40) that "it is possible to show that the two eldest-born are more liable to imbecility." Our table agrees in this, but at the same time brings out further facts. Not only are the two eldest born in excess of expectation, but all those from the third to the seventh are in defect, and all but one of those from the eighth onwards are again in excess. The following summary shows how marked is this divergence :—

Number of imbeciles (males) in each position in order of birth (Pearson and others : On the correlation of fertility with social value. *Dulau and Co.,* 1913) *and numbers to be expected, calculated from the sizes of their sibships. The decimals in the last column are due to twins.*

Order of birth.	Expected numbers calculated from the sizes of sibships.	Actual numbers of imbeciles in each position in order of birth.	Order of birth.	Expected numbers calculated from the sizes of sibships.	Actual numbers of imbeciles in each position in order of birth.
1 …………	327·1	367	11…………	5·9	10
2 …………	217·1	234·5	12…………	3·0	6·5
3 …………	177·1	155·5	13…………	1·2	2·5
4 …………	134·4	104	14…………	0·7	2
5 …………	98·7	91·5	15…………	0·4	2
6 …………	70·7	58·5	16…………	0·1	—
7 …………	48·0	30·5	17…………	0·1	—
8 …………	30·0	49·5			
9 …………	18·9	22			
10 …………	10·6	8	Total ….	1,114·0	1,144

	Expected numbers.	Actual numbers.
First and second children…………	544·2	601·5
Third to seventh children…………	528·9	440
Eighth onwards ………………………	70·9	102·5

In this respect the distribution differs entirely from that found by Dr. Goring for the criminal sibships, and, of course, from Dr. Heron's for insanity, which shows no appreciable bias. It is hardly necessary to say that the divergence in the present case is

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* *On the correlation of fertility with social value,* by Ethel M. Elderton, Amy Barrington, H. Gertrude Jones, Edith M. M. DeG. Lamotte, H. J. Laski and Karl Pearson. Dulau and Co., 1913.

"significant." Grouping together the thirteenth and upwards we find $\chi^2 = 51\cdot9$, which gives P slightly under 0·000001. In the case of imbecility, if these figures are typical, it is not merely the earlier born that are present in excess, but also the later born, and the proportionate excess is much the greater in the latter case.

As a final illustration, we have taken the data given in a Paper by Sören Hansen.* This author concludes that there is a markedly greater tendency to develop tuberculosis among firstborn siblings, his principal evidence being that, whereas among 3,522 tuberculous adults the proportion of firstborns is 281 per 1,000, among the offspring of all marriages of twenty-five years' duration and more there were only 173 firstborns per 1,000. It must, however, be pointed out that this result might also signify that the mean size of sibships of which at least one member is tuberculous is 1/·281, *i.e.*, 3·56, the mean size of all completed families being 1/·173, *i.e.*, 5·78.

The evidence of differential incidence can, as we think, only be obtained by the method employed in our other illustrations. Applying that process we reach the results given in the next table. Testing the goodness of fit as usual, $\chi^2 = 45\cdot59$, which gives P = ·0003 approximately. It will be noticed in this table that, although the excess of firstborns is only 10·9 per cent. as against 20.3 per cent. in Professor Pearson's case, the fit is worse, owing in part to deficiency of the fifth to ninth birth numbers and excess of twelfth and sixteenth.

Number of tuberculous persons in each position in order of birth (Hansen loc. cit.) *and numbers to be expected, calculated from the sizes of their sibships.*

Order of birth.	Expected numbers calculated from the sizes of sibships.	Actual numbers of tuberculous in each position in order of birth	Order of birth.	Expected numbers calculated from the sizes of sibships.	Actual numbers of tuberculous in each position in order of birth.
1	890·98	988	11...........	23·57	23
2	712·98	713	12...........	15·57	25
3	562·48	568	13...........	8·40	8
4	421·15	427	14...........	5·25	3
5	306·65	271	15...........	3·11	4
6	220·65	198	16...........	2·24	5
7	148·15	113	17 onwards	2·00	1
8	100·44	81			
9	59·69	46			
10	38·47	48	Total	3,521·78	3,522

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* Sören Hansen, "The inferior quality of the firstborn children." *Eugenics Review*, 1913, p. 252.

We may now briefly state the general conclusions which appear to us to be justified by the investigations detailed in this Paper.

With respect to the fertility of marked stocks, in particular stocks containing one or more members suffering from some disease, it seems to us clear that the size of family is not, as has been stated, abnormally large. On the contrary, so far as the data go they seem to support the conclusion that the fertility of such stocks is below the average.

Turning to the influence of birth number, it will be seen that, from Dr. Heron's data for sibships with insane members, no pathological weighting of the earlier born siblings can be demonstrated. In the case of Professor Pearson's tuberculous stocks, on the other hand, there is an appreciable excess, amounting to no less than 20 per cent., of marked firstborns. It is, however, to be noticed that the fit as tested by the χ^2 method is not very bad; and although this may be referred to the comparatively small total number of observations, Hansen's material, while giving a worse fit, does so largely owing to irregularities among the later birth numbers, the agreement between theory and observation in the case of firstborns being better than in Professor Pearson's data. That a judgment as to the pathological weighting of firstborns cannot safely be founded on the value of P given by the usual test is also shown by the case of imbeciles, where the frequency of later birth numbers is in excess of expectation. It seems to us possible that an additional disturbing influence may have been introduced in this case by some of the families not having been completed at the time the order of birth figures were computed. Dr. Goring's criminal stocks give a marked excess of pathological weighting among the early birth numbers, amounting, in the case of firstborns, to about 23 per cent., very nearly the same as that found in Professor Pearson's tuberculosis data. This result appears therefore to strengthen the inference to be drawn from Professor Pearson's data, but it must be remarked that, in the first place, the magnitude of the effect is very much smaller than had been supposed; and in the second, that, so far as criminals are concerned, Dr. Goring himself does not appear to attach any great importance to the result. We think accordingly that it would be at least premature to base any conclusions as to the racial effects of restricting fertility upon the view that earlier born members of families are of inferior quality.

In concluding this Paper it is desirable to point out that we have mainly confined our attention to a single class of fallacies which must, in our opinion, be eliminated before we can reach any true judgment as to the fertility of defective stocks and the importance of birth number. The problem is in truth beset with pitfalls, and we can only mention a few without further comment.

Weinberg, in his recent work on the children of the tuberculous,* points out that an important source of fallacy as regards birth number is afforded by the fact that size of family tends to vary with social class, with the consequence that, in forming tables similar to those discussed in this Paper, we may be mixing up heterogeneous records, unless care is taken to record each size of family separately, as is done by Dr. Goring, Hansen, and the authors of the last Eugenics Laboratory Memoir. We also agree with the opinion of Hansen. that the comparison of order of birth among the sibships of marked members in one community with the distribution observed in some other country, cannot lead to valid conclusions. This criticism may possibly affect the interpretation of the table on p. 23 of Professor Pearson's memoir.

Finally, it is of interest to note that Weinberg's analysis of the Stuttgart mortality records shows a higher *death*-rate among the later birth numbers when the influence of size of family is eliminated. This result is difficult to reconcile with a belief in the special pathological weighting of the earlier born.† Further, it has some bearing on the question of order of birth in the case of adult samples, as pointed out by Dr. Goring. Thus, if we apply the survival rates given by Weinberg (*op. cit.* p. 107, Table XIX) to Dr. Heron's asylum data, it would seem that it is a deficiency of firstborns, not an excess, that has to be explained. The deficiency is, however, small, and the survival rates used as a basis of correction are doubtfully applicable. As we have endeavoured to show, the whole problem is difficult, and we can hardly hope on the one hand to have avoided, and on the other to have mentioned, all the sources of error which are associated with it. It is, however, possible that the present Paper will be of service in initiating a discussion as to the validity of certain conclusions which have naturally attracted considerable popular attention.

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* *Die Kinder der Tuberkulösen*, von Dr. W. Weinberg, Leipzig, 1913.

† Professor Pearson (*op. cit.*, p. 24) has already pointed out that his result in the case of tuberculosis is not likely to be general.

DISCUSSION *on* PAPER *by* MR. GREENWOOD *and* MR. YULE.

MR STRONG asked whether the author had formed any idea of the number of mentally deficient children in England, which would be particularly appropriate having regard to the Mental Deficiency Act which was coming into operation on April 1 next year.

Mr. COBB[1] said he agreed with the conclusions in the Paper except as regards Professor Pearson's results. He thought the author had left out a certain amount of excess of first-born. He thought there was some method of correcting that. He suggested that the data might not be correct. If any patients were inaccurate about the numbers, they might possibly have forgotten the children who died before they were born, in which naturally there would be an excess of first-born. Apart from that, he thought that when the population was increasing that would lead to an apparent excess of first-born, because each year there were more of the first part of the family born than of the second part if the number of births increased yearly. Therefore, in that way, it was more likely to be an elder son than a younger. He thought if that were taken into account it would go a long way towards accounting for what was left.

The PRESIDENT said that the Paper appeared to him very useful as illustrating the difficulties of mathematical statistics. He would offer an additional caution. He doubted whether in applying the beautiful "criterion" employed in the Paper it was proper to use batches consisting of one or a very small number of observations. The problem, as he viewed it, involved a generalisation of the fundamental law as to the probability of drawing a certain number, say, of white balls from a bag containing black and white balls mixed in a given proportion. Everybody conversant with the subject knew that the regulation formula for the probability of a certain number (or more than a certain number) of white balls being drawn, the formula involving the normal law of error, did not hold good when the given probability was very small (in relation to the total number of balls drawn). The general problem might be illustrated by a bag or jar containing balls of several different colours, say all the colours of the prism.[2] If a large batch of balls were taken at random from such a mixture, and the balls of each colour in the batch were counted, the probability that these numbers should be identical with an assigned set of figures could be expressed as a (normal) *error-function* of χ; provided that the proportion of balls of each colour in the mixture was not very small. Analogously, in applying the criterion for the fit of a curve, it was proper to break up the given set of observations into pretty large slices. A slice consisting of a single observation was not admissible. There would not result a normal function, if you had very small probabilities; and you must have very small probabilities when you took only a single item. He proposed a vote of thanks to the authors of the Paper, which was carried unanimously.

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[1] Mr. Cobb's views are seated at greater length in the *Eugenics Review*, January, 1914, p. 357.

[2] See "A Method of Representing Statistics," a paper read before the Congress of Mathematicians, 1912 (*Report*, vol. ii, pp. 432-3).

Mr. Yule, in reply, said they quite agreed with Mr. Cobb that there was some residual excess of first-born to account for in the case of, for example, the tuberculosis data, and they suggested one factor that might have a bearing on the case, namely, the differential death-rate for children in different orders of birth; in fact he thought they both felt, after the conclusion of their work, very doubtful as to the possibility of definitely proving the existence of a real differential incidence of any character in order of birth. The whole question seemed so open to fallacious possibilities in different directions. For example, in the case of the imbecility data, it seemed quite possible that the curious character of the incidence might be due in part to the number in the sibship having been recorded at a time when it was not complete; when an imbecile was entered in an asylum at, say, the age of eight to ten, he could not possibly be entered then as first-born in a sibship of say twelve. The sibship then would not have reached the size of twelve; but the later members of the same sibship, if they were idiots, might be duly entered to the final size of the sibship, and that might upset the apparent relation between order of birth and imbecility altogether. With regard to the President's question respecting the use of the χ^2 method, he thought it was true that the weight to be attached to the numerical results was doubtful when some of the expected frequencies towards the end of the range were very small.

The following Candidates were elected Fellows of the Society:—

Sir J. M. Douie, K.C.S.I.
W. Fidler.
Hugo Hirst.
A. A. E. Hooper.
E. S. Jones, A.I.A.
Stanley Machin.
Lachmi Narayan.
J. T. Peddie.
A. S. Read.
F. W. Tattersall.
F. F. Tomlin, F.S.I., F.A.I.
Philip Vos, B.A.

A NEW ILLUSTRATION OF PARETO'S LAW.

By J. C. STAMP, B.Sc.

THE recent publication of the Fifty-sixth Annual Report of the Commissioners of Inland Revenue has for the first time rendered possible a direct application of Pareto's formula to the distribution of the higher incomes of the United Kingdom. Not for 112 years has any official statement appeared giving the total numbers of incomes of various amounts. Pitt's income tax of 1799 required returns from all individuals showing their total incomes from all sources, and the classification of the result, for 1801, for Great Britain, was as follows :—

Range of Income.	Number of persons in class.	Amount of total income in class.
		£
60*l*. to 95*l*.	140,429	9,555,854
95*l*. to 130*l*.	59,457	6,133,636
130*l*. to 165*l*.	33,407	4,626,541
165*l*. to 200*l*.	18,406	3,209,014
200*l*. to 500*l*.	42,694	12,239,081
500*l*. to 1,000*l*.	14,762	9,498,471
1,000*l*. to 2,000*l*.	6,927	9,041,154
2,000*l*. to 5,000*l*.	3,657	10,402,749
5,000*l*. and over	1,020	9,970,394
Total..................	320,759	74,676,894

But the attempt to tax income in one sum upon the total amount was given up in favour of the present piecemeal schedule system, in which "taxation at the source" was the cardinal feature, and as an immediate result the yield of the tax was doubled. The value of the above table is therefore considerably lessened, as it is not so likely that the *number* of incomes should be increased as that the *amounts* should be greatly altered, with a corresponding redistribution upwards. But if we assume the under-declaration of income to have been proportionate throughout, we have some index to the actual *distribution* at that time. The breaking up of the income tax into schedules has meant that no one has been required to give statements of total income unless for the purpose of claiming some abatement or relief, and the number of people not so claiming has, until recent times, always introduced an element of doubt into the statistics. Moreover, the available figures of abatements have given information for a very limited range. Even now, with abatements on incomes up to 700*l*., and with a lower rate contingent upon proof of total income not exceeding 3,000*l*., if statistics of all claims made were available they would not be complete, for unearned incomes from 700*l.* to 3,000*l.* are not "declared" in any way. The requirements of the supertax, however, include returns of every income over 5,000*l.* for taxation globally, in one sum, and it is the details of these returns and assessments which have now been classified in the official reports, showing the particulars in eleven stages.

In 1906, when the Select Committee inquired into the possibility of graduating the income tax, Dr. Bowley made use of Pareto's law applied to the existing data, in order to estimate the numbers and amounts of income over 5,000*l.* He made a skilful combination of hypothetical incomes from the estate duty capital for the upper range, abatements for the lower range, with house duty gradation for the body, to get an index or line of distribution, which when applied to the known totals of income assessed gave the amounts at the various stages. He also utilized the classification of assessments under Schedule D—a most difficult table to handle, and a very different thing from a classification of incomes. Its chief difficulties are in the higher classes where many assessments include large sums of interest paid (and therefore not "income" to the person assessed), while the assumption that there are two and a-half partners on the average to each firm probably does not hold in the large cases. Dr. Bowley had, however, to relate his figures to the total taxed incomes, and therefore felt it necessary to distribute 200,000,000*l.*, which was assigned to incomes above 5,000*l.* He obtained a Pareto index of 1·53, and his distribution of figures upon the estate duty basis, with a hypothetical "multiplier" of 32, and a rate of interest of 5·6 per cent., is given side by side with the supertax statistics in the table below. His additional "earned" incomes from the Schedule D tables referred to above are not so finely graded and have been omitted—the figures are given only for a comparison of the distribution and *not* of the total income dealt with. The estimates of the total income over 5,000*l.* were 200,000,000*l.* (Dr. Bowley), 250,000,000*l.* (Mr. L. G. Chiozza-Money), 148,000,000*l.* (Sir T. A. Coghlan), and 121,000,000*l.* (Sir Henry Primrose).[1]

The general agreement is very striking, having regard to the nature of the data upon which the estimate had to be made, and it should be noted that the official figures are avowedly not yet complete. The official figures, moreover, are exclusive of life insurance, since premiums have been allowed as a deduction in arriving at income for supertax purposes.

The accompanying graph shows the details of the supertax plotted logarithmically, on which method Pareto's formula[2] gives a straight

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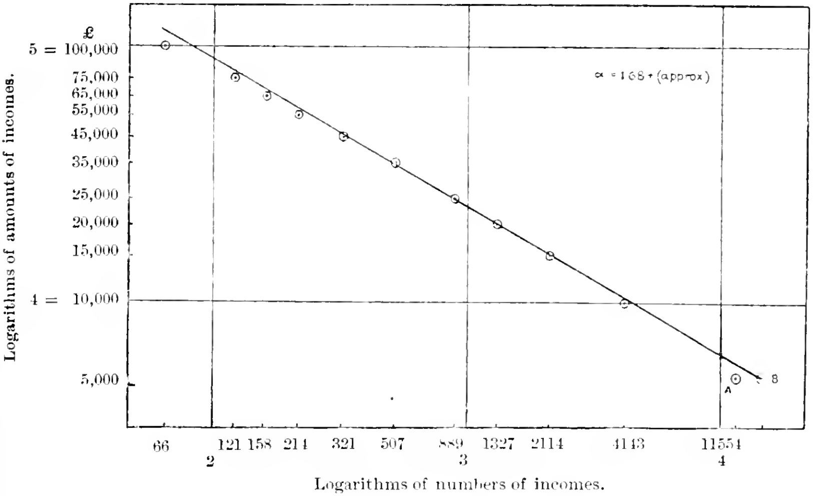
[1] *Report by the Select Committee*, 1906, Appendix, p. 261.

[2] Where x = any given income, and y = the number of persons with incomes of x or more, then $x^a y = b$, a and b being constants. It is also commonly expressed: $\log X = \log A - a \log x$ where X is the number of persons with incomes of more than £x (*i.e.*, X = y of the first formula and A = b of the first formula).

Supertax statistics, 1911-12.				Dr. Bowley's "unearned income" estimates.			
Groups.	Total incomes assessed.	Number of Persons.		Groups.	Total incomes assessed.	Number of persons.	
	£			£			
Not exceeding 10,000*l*.	50,850,830		7,411	5,000*l*. to 6,000*l*. 6,000*l*. to 10,000*l*.	15,000,000 37,000,000	2,876 4,852	7,728
Exceeding—							
10,000*l*., not exceeding 15,000*l*.	24,383,880	3,254	2,029	10,000*l* to 25,000*l*.	46,000,000	3,093	
15,000*l*. ,, ,, 20,000*l*.	13,550,046		787				
20,000*l*. ,, ,, 25,000*l*.	9,697.248		438				
25,000*l*. ,, ,, 35,000*l*.	11,099,384	* say, 625	382	25,000*l*. to 50,000*l*.	23,000,000	659	
35,000*l*. ,, ,, 45,000*l*.	7,303,011		186				
45,000*l*. ,, ,, 55,000*l*.	5,269,881		107				
55,000*l*. ,, ,, 65,000*l*.	3,353,446	* say, 264	56	Over 50,000*l*.	50,000,000	350	
65,000*l*. ,, ,, 75,000*l*.	2,575,501		37				
75,000*l*. ,, ,, 100,000*l*.	4.733,982		55				
100,000*l*.	12,176,735		66				
Total	144,993,944		11,554	—	171,000,000	11,830	

* It is necessary to split the class 45,000*l*. to 55,000*l*. to get groups comparable with Dr. Bowley's classes, and these two aggregates are suggested for the comparison.

line, and it will be observed how remarkably the actual distribution agrees with his law. Only the two highest stages (and the lowest) are to any material extent away from the line, and the highest points merely exhibit a feature that is common to all applications of the law—a falling away in numbers of the highest incomes. This feature is one that appears quite natural upon a consideration of the points involved, viz.. that as one approaches impossibly high incomes the numbers must fall away. Similarly at the lowest end, strict applications of Pareto's law fail, otherwise there would be an enormous population far below the subsistence level. So, remembering that all variations in numbers of incomes for the same



amount cause only *horizontal* movement of the points, in the former case we see the points move away from the line to the left (*i.e.*, fewer in numbers, measured along the base), whereas in the latter case of low incomes near the subsistence level, they are found to move away from the line to the right (*i.e.*, more in numbers). Pareto's line, adapted to cover the whole range of incomes, is therefore not straight, but like a reversed and very elongated S. In the present instance, the incomes below 5,000*l*. are still lacking, so that the second feature does not appear. We may obtain the index or slope of the line between any two points. In this instance the slopes corresponding with the maximum number of points are 1·66 to 1·68, and several cases are higher. These are very high figures, and certainly would not apply to the whole lower range of incomes from 700*l*. to 5,000*l*. The index found by Dr. Bowley for the higher incomes was 1·53, and it is not unlikely that the whole of this range of incomes would lie to the left of—*i.e.*, have a higher index than—any Pareto line which was true for the main range of incomes.

The feature upon this graph most calling for remark is the position of the lowest point (incomes over 5,000*l.*) at A instead of the position B, which would accord with the formula. There are three important considerations bearing upon this. (1.) It is natural to assume that the highest and most discernible incomes have been included, and that the incomes still to be declared and brought in belong to the lowest or least discernible class. It is at point A that nearly all new cases may be expected to come in.

(2.) The whole range of incomes excludes payments for life insurance. So far from the deduction affecting the incomes which are just at the limits of the classes proportionately throughout, and thus making no difference to the index, it is probable that such insurance is relatively of far greater importance for incomes about 5,000*l.* than for those for higher amounts. The number excluded from the class at its lowest limit would thus be greater than the compensation received from the class above, and a deficiency compared with the formula is a natural result.

(3.) It is highly probable, as indicated above, that the true index for incomes say from 1,000*l.* to 10,000*l.*, is appreciably less than 1·66. The line should therefore be steeper at this point and would cross the 5,000*l.* limit at a point much nearer to A than B is situated, indicating a smaller true number of incomes in this class than B would suggest. If we use the index obtaining between 20,000*l.* and 10,000*l.* (= 1·66) a calculation for A gives about 1,700 more incomes, but 1·60 would give 1,150 more, and the index of 1·53 only 500 more. (It is interesting to note that the index for the range 5,000*l.* to 2,000*l.* in 1801 was 1·66.) Of course this is only a computation after postulating the number of the classes above as correct, and is all that is needed to make the series *consistent*. It has no bearing upon the actual *correctness* of the whole series, which could only be established by relating the total to the whole amount assessed to income tax in a series which would be consistent in its other parts also; and such a reconciliation must necessarily be preceded by a discussion of the extent to which "income" is identical in scope and connotation for income tax and supertax purposes. A complete agreement for this part alone with Pareto's law is quite compatible with under-declaration throughout the whole of the part dealt with for supertax. These remarks are put forward only as a new illustration of that law, and have no reference to the statistical problem of the distribution of the total income assessed to income tax.

Notes on the Census of Ireland, 1911.

By Thomas A. Welton.

The main facts disclosed by the Irish Census are, of course, the total numbers of inhabitants and their local variations, and these may be briefly summarised as follows :—

	Population.		Gain.
	1901.	1911.	
Dublin City, with Pembroke, Rathmines and Rathgar, and Terenure	350,343	375,501	25,158
Belfast City	349,180	386,947	37,767
Cork City	76,122	76,673	551
Londonderry City	39,892	40,780	888
Limerick City	38,151	38,518	367
Waterford City	26,769	27,464	695
The residue of County Dublin	97,863	101,695	3,832
County of Kildare	63,566	66,627	3,061
	1,041,886	1,114,205	72,319
The rest of Ireland	3,416,889	3,276,014	—
Totals	4,458,775	4,390,219	—

In all Ireland, outside the few places named, there was an average decline in population amounting to about 4 per cent., although in particular places local increases were shown. The towns other than the six cities with more than 7,000 inhabitants were 23 in number, including 17 which showed some increase, but perhaps the first four in the following list should be regarded as being dependencies of larger places :—

	Population.			Population.	
	1901.	1911.		1901.	1911.
Blackrock	8,719	9,080	Ballymena	10,886	11,381
Bray	7,424	7,691	Sligo	10,870	11,163
Bangor	6,046	7,776	Tralee	9,867	10,300
Queenstown	7,909	8.209	Clonmel	10,167	10,209
Dundalk	13,076	13,128	Newtownards	9,110	9,587
Lurgan	11,782	12,553	Larne	6,670	8,036
Lisburn	11,461	12,388	Coleraine	6,958	7,785
Portadown	10,092	11,727	Athlone	6,617	7,472
Wexford	11,168	11,531			

The other six showed slightly decreased populations, as below :—

	1901.	1911.		1901.	1911.
Kingstown	17,377	16,941	Newry	12,405	11,963
Galway	13,426	13,255	Kilkenny	10,609	10,514
Drogheda	12,760	12,501	Armagh	7,588	7,356

It will be noticed that only Bangor, Larne, Portadown and Athlone had increased their populations by more than 10 per cent., a rate which in this country is regarded as normal.

The increase of population in the county of Kildare was confined to the rural district known as "Naas No. 1," in which the Curragh Camp is situate ; the number of military men (effective and retired) in that rural district was found to be 6,084.

The elaborate statistics of valuations for assessment, like the details of population and houses in very small areas, which characterise the Irish Census volumes, are not of general interest. It may, however, be noted that amongst the "Rural districts" which vary in area from under 20,000 to more than 200,000 acres, and where on a general average the assessments equal a little more than 11*s.* per acre, there are many in which the average is below 8*s.* per acre ; whilst, in a smaller number, that average exceeds 18*s.* per acre. The valuation includes, of course, the housing accommodation as well as the bare land, and the counties where it is lowest include extensive tracts of mountain, moor and bog. The subjoined little table will give an idea as to where the lowest and highest averages are met with :—

Counties.	Thousands of acres assessed per acre.			Counties.	Thousands of acres assessed per acre.		
	Under 8*s.*	Medium.	Over 18*s.*		Under 8*s.*	Medium.	Over 18*s.*
More than half area below 8*s.* *per acre*—				Fermanagh	58	359	—
Mayo	1,072	258	—	Longford	—	255	—
Kerry	1,157	—	—	Cork	709	936	187
Donegal	1,039	154	—	Waterford	40	343	68
Galway	962	496	—	Cavan	102	363	—
Clare	542	245	—	Londonderry	—	511	—
Sligo	223	216	—	Tipperary	—	1,042	—
More than half between 8*s.* *and* 18*s.* *per acre*—				Queen's County	—	425	—
Leitrim	177	199	—	Wexford	—	580	—
King's County	—	490	—	Kilkenny	—	509	—
Wicklow	51	412	33	Limerick	25	404	233
Roscommon	118	491	—	Carlow	—	221	—
Tyrone	92	574	110	Westmeath	—	433	—
				Kildare	—	359	54
				Monaghan	—	290	28
				Antrim	—	383	314

Counties.	Thousands of acres assessed per acre.		Counties.	Thousands of acres assessed per acre.	
	Medium.	Over 18s.		Medium.	Over 18s.
More than half area above 18s. per acre.					
Meath	200	377	Armagh	36	274
Louth	—	199	Dublin	—	211
Down	81	522			

Town assessments represent little if anything beyond the values of the houses, and the averages are in not a few instances as low as 9*l.* or 10*l.* per inhabited house, and in some a point or two lower; but in Dublin the average is nearly 27*l.*, in Queenstown 23*l.*, in Bray 21*l.*, in Belfast nearly 20*l.*, in Enniskillen 17*l.*, in Londonderry and Coleraine 16*l.*, and in Cork 15*l.* per house.

Comparing Belfast with Dublin, we find that Belfast shows a much larger proportion of families who have what is called "first-class" house accommodation. Where two families or more inhabit a first-class house, such families are not treated as having "first-class" accommodation. Of 9,320 first-class houses in Belfast 9,164 were inhabited by a single family. Of 8,688 first-class houses in Dublin, 4,599 were inhabited by a single family, 2,239 by from two to five families, and 1,849 by from 6 to 38 families, the remaining one being a barrack with 59 families. I am led to the conclusion that the average size of a first-class house in Dublin is much greater than the like average in Belfast, so that the classification is rather misleading, to the disadvantage of Dublin. On the other hand, it is no discredit to Belfast if with so many single-family houses the average rateable value per house is smaller than that of the houses in Dublin.

The occupations of the Irish people in 1911 may be summarised thus:—

Males—		
Agriculture, animals	713,131	
Fishing	8,538	
Mining, quarrying	2,216	
Defence	33,717	
		757,602
Commerce, shipping, shipbuilding	47,216	
Manufacture of textile fabrics	27,915	
Working in metals, machines	23,714	
Other manufactures	9,053	
		107,898
Residue of male workers, mainly engaged in secondary occupations	—	521,699
Total working males	—	1,387,199

Females—		
Agriculture	59,126	
Commerce	8,926	
Manufacture of textile fabrics	63,161	
Books and bookbinding	1,686	
		132,899
Residue mainly engaged in secondary occupations	—	297,193
Total working females	—	430,092

As agriculture is the predominant industry throughout Ireland, it will be sufficient if I show the exceptions to this rule.

The six largest towns are separately shown in the Census Tables of Occupations (within their municipal limits), and the residues of the counties in which they are situate are treated in the same manner as entire counties. Following that method, I proceed to show the highest ratios engaged in special occupations, always computed as percentages on the numbers of working males :—

	Per cent. Males.
Fishing—	
Waterford County*	2·1
Cork County	1·9
Mining—	
Kilkenny	1·4
Defence—	
Kildare	23·3
Limerick City	8·6
Cork City	8·4
Westmeath	6·7
Londonderry City	6·7
Cork County	5·6
Dublin County	5·0
Dublin City	4·8

	Per cent. Males.
Commerce, shipping, shipbuilding—	
Belfast City	14·1
Cork City	10·0
Dublin County	9·5
Limerick City	8·2
Dublin City	8·0
Londonderry City	7·7
Waterford City	5·7
Workers in metals, machines—	
Belfast City	10·8
Dublin City	4·0
Cork City	2·9
Dublin County	2·7
Londonderry City	2·6

* Where necessary the word county is used to distinguish the residues of counties containing cities.

Manufacture of textile fabrics—†

	Per cent.		Per cent.	
Armagh	12·3	males and	20·2	females.
Antrim	9·3	,,	13·5	,,
Down	8·5	,,	11·9	,,
Belfast City	6·9	,,	24·4	,,
Tyrone	2·7	,,	4·6	,,
Donegal	0·8	,,	4·4	,,
Louth	1·0	,,	5·0	,,

† Exclusive of drapers and mercers.

The manufactures of textile fabrics are chiefly comprehended under the title " Flax, linen manufacture," including products of dissimilar character and fineness. Manufactures of wool, silk, cotton, hemp, &c., also of lace and hosiery, are of small account. Embroiderers are numerous in Belfast, Down and Donegal, and in the last-named county there is a small manufacture of fancy goods.

The numbers of secondary workers are of interest, as affording an indication that social conditions vary considerably. Men who grow their own potatoes, distil their own whisky, build their own huts and wear ragged garments do not require many attendants. In towns and the wealthier counties things are more complex. The principal secondary occupations are most highly developed in the chief cities and the county of Dublin, which last embraces important suburbs of the capital, and the percentages of men engaged in these occupations and of those who constitute the remainder not belonging to the primary classes are now shown :—

	Principal secondary.	Indefinite and sundry.
	Per cent.	Per cent.
Dublin—		
City	50·3	27·4
County	43·9	19·2
Belfast	37·4	26·2
Cork	46·3	26·9
Londonderry	52·9	24·5
Waterford	51·3	30·6
Limerick	44·8	30·2

At the other end of the scale we have the following counties :—

	Principal secondary.	Indefinite and sundry.
	Per cent.	Per cent.
Galway	13·0	9·1
Longford	12·6	9·4
Fermanagh	12·5	7·5
Donegal	11·5	6·6
Cavan	11·4	7·2
Roscommon	9·7	6·7
Mayo	9·6	6·8
Leitrim	9·2	6·4

The section of female workers similarly employed cannot be correctly appreciated until we have eliminated the "shirtmakers and sempstresses," who are included under the title of "Workers in Dress," and are usually not very numerous, but in some parts of Ireland are engaged in wholesale production, thus :—

	Per cent.*		Per cent.*
Londonderry City	24·0	Tyrone	6·1
Down	7·7	Donegal	5·7
Londonderry County	6·8	Fermanagh	2·3
Belfast City	6·8		

* On the total number of male workers.

Excluding these, the women engaged in secondary and indefinite occupations bear the following proportions to the working males, viz. :—

	Per cent.		Per cent.
Dublin City	39·6	Belfast City	23·2
Dublin County	47·9	Wicklow	22·3
Cork City	39·8	Waterford County	21·4
Londonderry City	37·1	Wexford	20·6
Limerick City	39·0	Louth	20·3
Waterford City	36·6		

ranging downwards to—

	Per cent.		Per cent.
Roscommon	8·1	Cavan	10·8
Mayo	8·8	Galway	11·0
Leitrim	8·9	Donegal	11·1
Longford	10·8	Fermanagh	12·1

It will be noticed that these counties with low ratios are the same as those in which male secondary workers are fewest, and therefore I think they must be amongst the most primitive. Their names will also be found amongst those of counties in which the average assessments on rural land are low.

Occupations in the smaller towns (exclusive, that is, of the six largest) are also shown in great detail and are not without interest. The following are the most noticeable ratios of primary workers in them, computed as percentages on the numbers of working males :—

	Per cent.		Per cent.
Fishing—		Pembroke	7·9
Galway	6·7	Queenstown	6·9
Commerce, shipping, shipbuilding—		Larne	6·6
Rathmines	19·0	Defence—	
Bangor	16·1	Fermoy	51·6
Pembroke	13·4	Tipperary	30·3
Blackrock	11·2	Athlone	23·4
Queenstown	8·8	Rathmines	14·0
Kingstown	8·7	Clonmel	13·2
Tralee	7·8	Queenstown	12·5
Workers in metals, machines—		Armagh	9·2
Wexford	8·3	Dundalk	8·9
		Kilkenny	7·7

Manufacture of textile fabrics—	Per cent.		Per cent.	
Lurgan	42·6	males and	57·7	females.
Lisburn	31·3	,,	45·0	,,
Portadown	28·7	,,	48·0	,,
Newtownards	17·7	,,	28·9	,,
Ballymena	11·9	,,	36·4	,,
Athlone	8·6	,,	6·5	,,
Newry	7·5	,,	21·9	,,

Turning to a very different subject, viz., the civil condition of the population, we are confronted by the fact that the proportion of bachelors in Ireland is extraordinarily high.

In 1901 the proportions of single men were :—

At age 45–55 .... 23·8 per cent.
,, 55–65.............................. 18·6 ,,

The like figures were, in 1911 :—

At age 45–55.............................. 27·3 per cent.
,, 55–65.............................. 22·3 ,,

so that the proportion of bachelors appears to have increased.

The marriage-rate in Ireland is extremely low, but the birth-rate, tested in a proper manner, is found to be generally high. Belfast differs in both respects from the other parts of Ireland.

I have arrived at the marriage-rate by (1) a comparison of the number of marriages in 1901–10 with the mean number of bachelors aged 20–35 returned at the Censuses of 1901 and 1911 ; (2) comparing marriages in 1911 with bachelors aged 20–35, according to the Census of that year ; and the birth-rate similarly by (1) comparing births in 1901–10 with the mean number of married women under 45 at the two Censuses ; (2) comparing births in 1911 with married women under 45, as shown by the Census of that year.

These comparisons are not precise but are near enough in prac The results, with the ratio of bachelors at ages 45–55 in 1911, are shown in the following table :—

Counties.*	Per cent. Bachelors age 45-55.	Marriage-rate.		Birth-rate.	
		1901-10.	1911.	1901-10.	1911.
Birth-rate fully 30 *per cent.*—					
Queen's County	40·3	3·67	4·36	29·5	32·3
Westmeath	38·8	4·07	4·07	28·7	30·8
King's County	37·2	4·46	4·79	28·6	31·6
Tyrone	35·7	5·51	6·75	29·6	30·6
Monaghan..........................	35·3	5·21	5·72	29·2	30·1
Wexford	34·7	4·97	5·23	30·7	31·7
Fermanagh	34·4	4·81	5·17	30·3	30·7
Cavan	33·5	4·25	4·66	28·7	30·4
Kilkenny	33·5	4·22	4·61	31·2	31·8
Donegal	32·8	4·85	5·00	33·9	35·0
Tipperary	32·4	4·11	4·66	31·3	32·5
Longford	30·9	4·46	4·76	29·4	31·3
Sligo	29·8	4·64	6·05	32·1	33·8
Clare	29·4	3·51	4·16	31·6	31·0
Galway	28·2	3·78	3·66	33·2	36·0
Roscommon	27·9	4·16	4·93	29·7	31·8
Limerick	27·3	5·02	5·88	32·7	33·7
Leitrim	26·2	4·86	5·15	30·4	32·5
Londonderry	24·4	6·97	7·37	31·8	30·4
Dublin City	21·4	8·02	8·17	31·3	31·1
Kerry	20·0	4·68	5·18	34·7	35·6
Mayo	18·0	4·62	4·91	33·3	36·2

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* Only Dublin and Belfast are shown separately.

Counties.	Per cent. Bachelors age 45-55.	Marriage-rate.		Birth-rate.	
		1901-10.	1911.	1901-10.	1911.
Birth-rate under 30 per cent.—					
Meath	41·4	4·03	4·65	28·8	28·1
Kildare	36·4	3·18	2·59	30·3	28·9
Louth	33·5	4·61	5·18	28·8	29·8
Carlow	32·9	4·55	5·23	29·4	29·1
Wicklow	32·0	5·08	4·85	27·5	25·8
Waterford	29·7	4·84	4·69	29·7	29·9
Armagh	28·0	7·16	7·48	29·1	28·8
Antrim	26·2	7·32	7·31	29·7	29·0
Down	24·5	7·05	7·03	27·6	26·8
Dublin County	24·4	6·14	6·23	22·7	21·1
Cork (with City)	24·2	4·88	5·00	30·6	29·9
Belfast City	12·7	10·51	10·76	28·1	26·2

The presence of military forces in Kildare naturally exaggerates the number of bachelors and so depresses the marriage-rate.

In England and Wales in 1901 the percentage of bachelors amongst men aged 45–55 was only 11 per cent. The average marriage-rate to 100 bachelors aged 20–35 was as high as 12·3 per cent., varying from 13·9 to 9·5 in groups of counties. The average birth-rate in 1906 was about 23·2 per cent. It will therefore be seen that even Belfast has more numerous bachelors, fewer marriages and a higher birth-rate than the English average.

The figures for Dublin county are affected by the migrations which always take place from the centre of a city to its suburbs. Any close inquiry into local movements of population at different ages is, however, discouraged by the uncertainty we cannot help feeling as to the truthfulness of the returns of ages, now more than ever accentuated, as will be seen by the appended table. The exaggerated returns of old people are most remarkable in some of the western counties, the following being cases in point in declining populations :—

	Females, 65—70.		Females, 70—75.		Males, 70—75.		Females, 75 and up.	
	1901.	1911.	1901.	1911.	1901.	1911.	1901.	1911.
Donegal	1,957	3,492	2,066	4,849	2,117	3,855	2,390	3,689
Kerry	1,596	2,896	1,755	3,676	1,812	2,934	2,229	2,786
Clare	1,219	2,004	1,454	2,783	1,449	2,272	1,847	2,129
Galway	2,019	3,416	2,105	5,124	2,381	4,298	2,470	3,305
Mayo	2,024	4,048	2,228	5,276	2,341	4,331	2,322	3,753
Roscommon	1,189	2,131	1,202	2,604	1,368	2,245	1,222	1,720

The large numbers returned in 1901 at ages 50–55 and 60–65 (in the following table), compared with those of people five years younger, were doubtless due to a tendency to return the age as a round number. This would appear to have lost some of its force, and has been succeeded by a tendency to exaggerate the numbers at ages 65 and upwards. The materials before us are insufficient to justify a guess as to what the true numbers were in either year; but those returned at the last Census are clearly wrong, even if the 1901 figures are pretty nearly right.

Ireland. Ages of total population as returned in 1901 *and* 1911.

Age.	Males.		Change.		Per cent.	
	1901.	1911.	More.	Less.	More.	Less.
0–5	224,830	220,784	—	4,046	—	1·8
5	228,430	222,132	—	6,298	—	2·8
10	234,232	217,311	—	16,921	—	7·2
15	235,000	214,923	—	20,077	—	8·5
20	217,297	191,318	—	25,979	—	12·0
25	174,787	159,905	—	14,882	—	8·5
30	146,103	152,188	6,085	—	4·2	—
35	116,657	145,740	29,083	—	24·9	—
40	117,142	127,486	10,344	—	8·8	—
45	90,049	102,801	12,752	—	14·2	—
50	104,425	95,338	—	9,087	—	8·7
55	70,887	72,675	1,788	—	2·5	—
60	98,305	65,035	—	33,270	—	33·8
65	50,028	70,100	20,072	—	40·1	—
70	46,273	73,889	27,616	—	59·7	—
75 and upwards	45,595	60,423	14,828	—	32·5	—
Totals	2,200,040	2,192,048	—	7,992	—	—

Age.	Females.		Change.		Per cent.	
	1901.	1911.	More.	Less.	More.	Less.
0–5	217,882	214,921	—	2,961	—	1·4
5	222,450	215,730	—	6,720	—	3·0
10	225,378	209,761	—	15,617	—	6·9
15	237,787	208,091	—	29,696	—	12·5
20	226,907	184,910	—	41,997	—	18·5
25	187,810	171,211	—	16,599	—	8·8
30	147,933	152,706	4,773	—	3·2	—
35	122,695	142,288	19,593	—	16·0	—
40	126,281	121,265	—	5,016	—	4·0
45	98,212	99,314	1,102	—	1·1	—
50	120,775	96,722	—	24,053	—	19·9
55	76,750	73,915	—	2,835	—	3·7
60	105,265	70,856	—	34,409	—	32·7
65	47,163	75,771	28,608	—	60·7	—
70	47,474	94,448	46,974	—	98·9	—
75 and upwards	47,973	66,267	18,294	—	38·1	—
Totals	2,258,735	2,198,176	—	60,559	—	—

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Report of an Enquiry by the Board of Trade into working-class rents and retail prices, together with the rates and wages in certain occupations in industrial towns of the United Kingdom in* 1912. [Cd-6955.] Fol. 1913. Price 4*s.* 11*d.*

The Board of Trade's second "Cost of Living" Report belongs to the select class of official statistical publications whose contents obtain a wide circulation either directly or indirectly among the general public. In fact, it may be doubted whether any other report of the kind has ever had so practical an importance to the working classes; for immediately it appeared, it became admissible "evidence" in wage adjustments of all kinds. The first report contained important data as to rents, prices and wages in different localities, but a statement of the changes over a period of years, which the second report also furnishes, is of far more practical significance. Moreover, the comparative use of figures collected by the same method at different times avoids many of the statistical difficulties involved in attempting to compare the cost of living in different places at a given time.

In this connection it may be remembered that the selection of London as base in the first report was criticised on the ground that it involved an error in weighting in the case of rents, which are so much lower in other parts of the country than in the metropolis. The Board has not seen fit to modify its method to meet this criticism, for it is stated in the report that "if the rents and retail prices index-"number calculations were based on the *means* of the rents and "retail prices in all towns, the statistical relationship between the "separate towns would remain practically unchanged."

It is, however, worth pointing out that for practical purposes the town index numbers are not nearly so important as the material from which they are calculated, and in using them for determining local standards of wages (as has been done, for example, in the case of postal servants) local variations of retail prices can practically be disregarded. The index numbers of the 88 town units in the United Kingdom are distributed as follows as regards rents and retail prices respectively :—

Index numbers.	Retail prices.	Rents.
36–40	—	1
41–45	—	5
46–50	—	8
51–55	—	20
56–60	—	21
61–65	—	13
66–70	—	12
71–75	—	3
76– 80	—	1
81– 85	—	3
86– 90	1	—
91– 95	26	—
96–100	47	1
101–105	12	—
Over 105	2	—

Of the towns with price indices in the 91–95 group, 18 are at 94 or 95, while 10 of the towns over 100 are in Scotland and Ireland. When it is remembered what opportunities there are for errors in the compilation of retail price statistics, it is doubtful whether much importance can be attached to a local difference of as much as 5 per cent. Moreover, the price of coal is chiefly responsible for such differences as are shown in the Board's report. There is thus much to be said for the practice of many railway companies who only recognise local variations to the extent of allowing 2*s.* or 3*s.* extra rent allowance on their normal rates to those of their employees who have to live in London. It is possible that greater price differences would be shown as between urban and rural districts, which would have to be taken into account by agricultural wages boards ; but the report, of course, throws no light on that particular problem.

As regards the comparison between the present figures and the 1905 report, it is impossible here to give an account of the many interesting points that emerge. As might be expected, rents do not show uniform change, but vary from an average decrease of 10 per cent. in Burton-on-Trent, to an 18 per cent. increase in Coventry. Slow or rapid increase of population, transport facilities, &c., are responsible for those purely local movements. The average increase of 1·8 per cent. in the 87 towns outside London would almost certainly be more than accounted for by the upward tendency of local rates, which are included in the rent statistics. If London is included there is actually a decline of 0·3 per cent. in average rents. On the other hand, retail prices show a fairly uniform upward movement, averaging 13·7 per cent. for the 88 towns. In 80 cases the increase lies between 10 and 18 per cent. ; the cases outside this range being due to special circumstances which are in most cases fairly obvious. The increasing use of the port of Southampton places that town almost at the bottom of the list, while the removal of tolls and the development of road motor transit between it and Portsmouth is responsible for the fact that the latter town, which was one of the highest-price towns in 1905, only suffered an increase of 7 per cent. Some curious differences from town to town are shown in the case of particular commodities, which are well worthy of study, as throwing some light on the way in which retail prices are actually determined; but the data require very careful scrutiny in order to be sure that we are dealing with goods which are of uniform quality and bought under the same conditions of marketing, &c.—difficulties which are discussed in last month's *Journal* by Mrs. Frances Wood.

The report does not attempt to give an average wage index number for the various towns, nor does it use its cost of living figure to obtain a "real wages" index number. But it is evident from the returns that there is no tendency towards any uniformity of real wages as between different towns, nor do the real wages of different grades of labour in the same town diverge from London standards by a uniform amount. In Belfast, for example, skilled engineers are as well, or better, off than in London, but the real wages of engineers' labourers are far below the London level. Divergences such as these, which are more marked than price variations but less so than rents, are, of course, to be expected, and depend on the character of the local labour supply. A feature of the report is the slow rate of increase of the wages of skilled artisans compared with the rise in the cost of living.

By no means the least valuable part of the report is the series of memoranda on the course of prices abroad, in which are assembled the chief statistics relating to both wholesale and retail prices in eleven foreign countries and three British dominions. W.T.L.

2.—*Die statistische Methode als selbständige Wissenschaft.* Von Dr. jur. Hugo Forcher. 365 pp., 8vo. Leipzig: Veit and Comp., 1913. Price 10 marks.

The development of statistical science in this country has proceeded on lines distinct from those followed on the Continent. In England, for the most part, theory has been developed because practice required it, and comparatively little has been done of recent years to extend statistical methods as an independent science. On the Continent, on the other hand, apart from the works of certain psychologists, in most publications the practice has been subordinate to the theory, and practical problems have only been referred to as numerical illustrations of the theoretical principles.

The book before us provides no exception to this statement. It gives a clear account of the fundamental ideas underlying the theory of probability applied to a single variable and of certain statistical methods based upon these. But it does not describe the many interesting and important pieces of theory which have been developed in this country in the last few years as contributions to the solution of various practical problems. The treatment is mathematical throughout, and geometrical methods are frequently employed. The first section of fifty pages is devoted to a description of the chief theorems and formulæ in the theory of functions of a real variable, and includes an account of those portions of the differential and integral calculus which should be understood by students of statistical methods. This part of the work is thoroughly done, and prepares readers with little previous mathematical knowledge for the portions which follow.

The second section deals with the ideas and theorems of probability proper and covers a wide field. The elementary theorems in permutations and combinations are proved. Direct, indirect, and *a posteriori* probability, mathematical risk and expectation are treated of in detail. The accounts of the Bayes-Laplace and Bernoulli's theorems follow those of Czuber and are well illustrated with frequent examples. The treatment of the subject of the theory of errors is exhaustive, and the chapter on this contains much which to English readers is not accessible in the limits of a single book. The illustrations given in this part deal with the question of sex-ratios; the well-worn examples of the variations in the sex-ratio of births (*e.g.*, from month to month or from year to year) being supported by others discussing the variation in the sex-ratio of criminals at different ages from year to year, and similarly of the number of suicides. Other subjects dealt with include the Gompertz-Makeham law of mortality and the analysis of the mortality curve throughout the range of life into components. This last is based upon the work of Lexis, and is referred to chiefly as giving an example of the normal law of distribution of the mortality of old age; the English work on this subject is not described. The chief types of generalised frequency distribution are deduced from the fundamental differential equation, but no detailed account of their range of application nor the principles underlying their use is attempted. A bibliography is included, and this might with advantage have included more references to English work than the three (out of thirty-seven) actually given.

The book invites little criticism, and can be recommended as giving a sound exposition of the subjects of which it treats. There is need, indeed, for such a book in our own language. At present the material is scattered in various papers and memoirs, and apart from Professor Edgeworth's article in the last edition of the *Encyclopædia Britannica* we know of no English book to which the mathematical student can turn for an account of the subject discussed in the book under review. E.C.S.

3.—*Les Crises Périodiques de Surproduction.* Par Albert Aftalion. Tome premier, xii + 324 pp.; Tome deuxième, 418 pp., 8vo. Paris: Marcel Rivière et Cie., 1913. Price 16 frs.

Good and Bad Trade: an Inquiry into the Causes of Trade Fluctuations. By R. G. Hawtrey. viii + 279 pp., crown 8vo. London: Constable and Co., 1913. Price 6*s.* net.

Business Cycles. By Wesley Clair Mitchell. xviii + 609 pp., 4to. Berkeley: University of California Press, 1913. Price $5.

These three books, published during the past year in England, France and the United States respectively, deal in common with one general subject. But, while those proceeding from this side of the Atlantic bring into special prominence particular aspects of the question, and the French Professor, at any rate, has disclosed some fresh *aperçus* on certain points of interesting detail, the third is more elaborately comprehensive. It bids fair, we venture to pronounce, to be regarded as the classical authority for future students. Not merely has the indefatigable writer collected in convenient shape all the pertinent statistics forthcoming from the three countries named already, together with the important addition of Germany, but he has applied to their examination the penetrating acumen and the sane persuasive judgment which he displayed with much advantage some years back in his earlier study on the issues of the "greenbacks." In no less difficult a region of inquiry he has shown again his remarkable capacity for finding his way safely through a tortuous maze of figures; and he has, so far as we can judge, been equally successful in assigning the appraisement that is due to the different portions of the large masses of numerical data handled. We have been filled with admiration—we had almost added with astonishment—when we have tried to achieve a rapid survey of the vast field which Mr. Mitchell has thoroughly explored and satisfactorily mapped. His study is, we think, a veritable monument of combined diligence and skill; and for significant fact and suggestive opinion alike recourse will constantly be had to these lucid and exhaustive chapters by statisticians, by economists, and by statesmen and business organisers in every country where the phenomena here defined, investigated, and explained have become normally recurrent.

In that summary review of the leading theories of other writers, which Mr. Mitchell has prefixed to his statistical inquiry, as in his own description of the modern arrangements of the business world and in his graphic faithful picture of the antecedents, the genesis, character and outstanding features, and the sequelæ of trade crises, he is not least successful when he proves that what were once regarded as extraordinary events, for which some exceptional reason should be sought and found, are now considered to be usual incidents, taking their necessary place in a series of movements which lead inevitably, it may almost be said, to their regular periodical repetition. The significant change of attitude is demonstrated by the employment both by him and by Professor Aftalion of the expressive term "rhythm" as applied to the fluctuations which they note and expound, and by the substitution of a scrutiny of "business cycles" for an account of commercial or financial "crises."

The English volume, by Mr. Hawtrey, is the shortest of the three; and it is also perhaps not so novel or convincing in the leading idea advanced as the propounder thinks. That is, in his own words, that "fluctuations are due to disturbances in the available stock "of 'money'—the term 'money' being taken to cover every species "of purchasing power available for immediate use, both legal tender "money and credit money, whether in the form of coin, notes, or "deposits at banks." In the course of the development of this thesis Mr. Hawtrey supplies some clear and useful descriptions of the monetary and banking systems of England, France, India and the United States; and, while he agrees with the other two writers in considering that depression naturally leads to excitement and *vice versâ*, he does not repose much faith in the validity of remedies for what thus normally recurs. But, in contrast with Professor Aftalion and Mr. Mitchell, he may be described as skimming the surface rather than plumbing the depths. There can be no doubt that an expansion of credit accompanies good trade as a contraction attends bad trade. There can be little dispute that the development of what Mr. Hawtrey calls "credit money" has permitted an elasticity, joined to an insolidity, which were comparatively unknown in the more tranquil, if less stirring, times when the tide of business was sluggish both in its flow and in its ebb. But after all, while the change in the monetary movement which he notices may possibly be always present when the commercial and industrial vicissitudes occur, and may thus be inseparably associated with their periodic variation, if "money" at least be interpreted in the large sense required, the one may not be a cause and the other an effect, but they may only be concomitants. It should, however, be observed here that Mr. Mitchell is equally emphatic in his turn in calling attention to the significant exclusive notice paid in the modern business world to "money-making." The test of success is the achievement of a monetary profit and not an addition to the world's command of useful commodities.

Professor Aftalion in the second of the two volumes, into which his larger and more profound treatment of the subject is divided, puts forward a different theory about the cause of periodic crises. While he allows that "universal over-production," as many economists have triumphantly contended, is self-contradictory, and, while he maintains that a like dilemma confronts those who would generalise particular excesses of supply, and is not candidly, or adequately, met by those who postulate either "under-consumption" or "inadequate saving," he himself nevertheless inclines to a view not entirely dissimilar. For he argues that, owing to the common organisation of modern business, with its large use of durable and costly elaborate mechanical equipment, there may be recurring "mal-adjustment" between supply and demand which amounts to a general dislocation. In other words, as Mr. Mitchell puts the position in his summary of the Professor's theory, while "there can be no general fall of values in exchange" (because supply is the obverse to demand) "there can be such a fall "of values in use." The new equipment, which took time to instal, continues to yield goods in great masses when the urgency of the demand, stimulated by the preceding scarcity, has relaxed in consequence of satiation. The credit-movement, to which Mr. Hawtrey pinned his theory, Professor Aftalion regards as a consequence of a more fundamental force and as an effect rather than a cause. But he recognises as responsible for what occurs the distinctive character of the modern organisation of business, in which the large use of credit is a prominent feature.

Perhaps, however, his first volume, in which he scrutinises those periodic variations for which he develops this explanatory theory in the second part, is the more satisfactory portion of his essay. It is at any rate in many ways suggestive. The idea that a "rhythmic" movement is generally discovered in economic life, and does not find a singular illustration in the recurrence of crises of over-production, is a pertinent and stimulating thought. No less opportune and luminous are the reasons given for the known facts that wages do not fall so fast or so far in periods of depressed trade as prices and that per contra they do not rise so far or so fast in prosperous times. The explanation advanced is that the equipment, with which they are connected, tends to be inferior in the seasons of good trade to what it is in the days of bad business; and therefore the productivity of each individual wage-earner is probably more considerable during the ebb than it is during the flow of the tide. With similar instructiveness the variations in the rate of interest are brought into close relation with that comparison of the present with the future on which expositors of the more recent theories of interest have laid the stress of their argument. When business is active the command of present goods is obviously more imperatively sought, and future goods sink in relative esteem. The discussion by Professor Aftalion of the comparative effects of the ups and downs of trade on the prices of different categories of goods is equally fresh and apposite.

But, with all these conspicuous merits, the French treatise must, we hold, yield the position of primacy to the American "memoir." Mr. Mitchell's work is the third of such publications which have been issued by the University of California, and we are sure that, if the two previous "memoirs" which dealt with other departments of erudition were as thorough and as competent as this fresh contribution to our economic and statistical knowledge, the Western seat of learning has earned the sincere gratitude of all who can appreciate research. Although the author does not disregard economic theory, and has made contributions of his own in this book, he derives his opinions directly from the facts. But he does not on that account allow himself to fail "to see the wood for the "trees" in the investigation of those facts; and, although no one could with any show of justice reproach him for lack of comprehensiveness in the numerical data he has collected and examined, he has employed an "intensive" rather than an "extensive" method. He has limited his inquiry to the last twenty years. Within that period, thus prudently circumscribed, bearing in mind what he has rightly emphasised as the directing motive of the modern business man, which is, in his opinion, the "making of money," he investigates, in succession, the prices, first of goods, then of labour, then of loans and then of shares in business enterprise. From these figures he proceeds to those relating to the volume of business, to the currency, to banking, saving, investment, enterprise and speculation; and in conclusion of this section of his inquiry he considers the statistics in the four countries, to which he confines his survey, of profits and of bankruptcies. Equipped with this full armoury of systematised knowledge he is ready in the third part of his treatise to describe what he aptly calls, as we have previously noted, the "rhythm" of business activity. He indicates the various steps by which prosperity grows; and then in turn he distinguishes the successive stages by which a crisis is produced. Finally he takes for special illustration the crisis in the United States of 1907 and that in England of the same year. In this complete manner, of which our summary may give some faint idea, does Mr. Mitchell treat his subject; and we have not succeeded in our aim unless we have induced our readers to acquaint themselves forthwith with the text of this memorable book. It is, in our opinion, in the truest sense of the words, an *opus magnum*, happily conceived and worthily executed. L.L.P.

4.—*A history of emigration from the United Kingdom to North America*, 1763–1912. By Stanley C. Johnson, M.A. xvi + 387 pp., 8vo. London: Routledge and Sons, Ltd., 1913. Price 6*s*. net.

This book, published in the Series of Monographs by writers connected with the London School of Economics and Political Science, and approved as a thesis for the degree of Doctor of Science (Economics) in the University of London, comes at an opportune moment. The Dominions Royal Commission, appointed to consider, *inter alia*, the various aspects of emigration from this country and of immigration to the colonies, have already issued a large volume of evidence concerning migration, and are to receive more from the Dominions. This volume indicates that some diversity of opinion exists in England as to the desirability of maintaining a large flow of emigration from our shores, and a history of the nature of the emigration of the past, its causes and results, is for this reason the more required.

Dr. Johnson opens with an historical survey of emigration from Great Britain and Ireland to North America (separating, for the most part, the United States from the British portion of the continent), and then discusses the causes of emigration, the assistance, transportation and restriction of emigrants. Further chapters deal with the various colonisation schemes that have been attempted, the emigration of women and children, the economic and social value and the problems of emigration.

The historical part of Dr. Johnson's work is excellent and indicates much research. His descriptions of the various aspects of emigration in the nineteenth century will be of value to those earnest people who, in the twentieth century, desire to employ emigration as a means of ameliorating the lot of many in this country and of developing the Dominions, and who have an imperial interest in learning thoroughly the lessons of history. It is interesting to note that at the beginning of the nineteenth century the changing of arable into pasture land was held to be a cause of migration, and that the recent report of the Board of Agriculture gives the same as a potent cause in 1913.

While paying tribute to the historical side of this book, we feel that other parts of it are somewhat superficial. The author readily accepts many statements based upon statistical evidence, without examining the statistics in a thorough manner. We admit that some of these have passed muster for many years, but in a book of this nature we had hoped to see them properly weighed. As an example, we would point to the treatment of the subject of the emigration of women from this country. The author, following many others, states that there is an excess of women over men in this country amounting to 1,178,317,[1] while in Canada there is a surplus of men, and concludes "that an exodus of women is "attended with beneficial results, as its tendency is to equalise "the sexes both in the country of departure and that of arrival." Had Dr. Johnson analysed the figures according to marital condition, age distribution and social status he would have found that the commonly accepted view as to the desirability of emigrating the large surplus of women here probably requires modification. Again, figures are quoted with approval from an American review, in which it is stated that while the foreign-born element in New York was only 36 per cent. of the total, the deaths from tuberculosis among those of foreign maternal parentage were 86 per cent., as final evidence that "the alien is the chief sufferer." Since the large majority of the deaths from this disease occur between the ages of 15 and 55, at which period the proportion of foreign-born is much higher, this is surely a case in which the age distributions of the two populations should be compared. We fail to see, also, how Dr. Johnson has arrived at the conclusion that the death-rate (0·19 per cent.) on voyage of passengers sailing to Canada in 1863 was no higher than would have occurred had they remained on land. He refers to the large proportion of children and the high marriage-rate of women in Canada, but shows no figures. On the latter point we are unaware that any reliable ones exist for the whole of Canada, and on the former the statistics hardly support the adjective employed.

Other statements in the book would have been modified had figures been examined. The question of the flow of population from the United States to Canada is referred to, but the difficult matter of the reverse flow is not discussed. That this is considerable is evident from many sources, and was the text for a wild outburst in the Canadian Press when it was discovered that the census population of 1911 was about 800,000 less than had been estimated.

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[1] This was the figure given in the preliminary Census Report, but was subsequently modified. Dr. Johnson rarely uses round numbers, even when, as in the case of the figures of emigration of the early part of the nineteenth century, he shows that the statistics are subject to very large errors.

The book contains a fairly complete but by no means exhaustive bibliography. It is unfortunate that no mention is made of the volume of evidence on the subject given before the Dominions Royal Commission in 1912 and issued ten months before the book was published. Though we have to criticise Dr. Johnson's book from the statistical standpoint, we acknowledge it to be a valuable contribution to the subject and, with the proviso that those inferences depending upon statistical evidence should be taken with some amount of scepticism, can thoroughly recommend its reading.

E.C.S.

5.—*An Agricultural Faggot.* By R. H. Rew, C.B. x + 187 pp., demy 8vo. London: P. S. King and Son, 1913. Price 5*s*. net.

In publishing these Papers on agricultural subjects, written at various dates during the past twenty-five years, Mr. Rew has placed under double obligation many of his numerous agricultural friends on the one hand, and, on the other, a wider circle of less well instructed political and economic enquirers whose attention to rural problems has been provoked by the trend of recent controversy on social problems bearing on the land, its use and its development. The range of the matters here dealt with, in their aspects at the periods of the original production of the separate essays, is wide. Historical English farming, labour movements, market practices and efforts at agricultural co-operation in several different directions, as well as reflections on the different features of British and French agriculture are discussed in detail, and the reader will find in the volume the concisely summarised statistics of the actual portion of the nation's food supply, which attracted much attention when presented in 1912 on the occasion of the first meeting of a distinctly agricultural section of the British Association for the Advancement of Science.

Although latest in date of production, Mr. Rew naturally places first his review of farming in olden times, read before the Farming Club only in May last, and the student who would rightly appreciate the possibilities of some favourite modern theories would do well to weigh what so competent and so impartial a writer calls to mind in both the lessons and the warnings of our older agricultural record. In a second essay, dealing with the later experience of agriculture under Free Trade, 1846–96, occasion is taken to trace with an accuracy not often apparent in the writings of more partisan historians, a clear account of what the Corn Laws actually were. The Paper shows how the course of events since their repeal differed in many instances from earlier anticipations. Mr. Rew quotes McCulloch in claiming for the arable land of the United Kingdom a surface of nearly 22,000,000 acres in 1846, while the first complete agricultural returns gave 23,000,000 acres in 1867—a figure not reduced to 20,000,000 acres until quite thirty years later.

In dealing with the migration of agricultural labourers more than twenty years ago—and on the basis of the census of thirty years ago—Mr. Rew again touches a problem still alive to-day and incidentally quotes estimates which are sometimes overlooked in the wage controversies of to-day, and dealing with the relation which wages bear to the aggregate value of agricultural produce he reveals the magnitude of the share which inevitably falls to labour.

To the defects of our English system of marketing produce Mr. Rew it may be noticed, devotes no less than five of his ten chapters. In the Paper reproduced from the *Journal of the Royal Agricultural Society* in 1892, an historical retrospect of the origin and growth of the markets and fairs of the country recalls a story which has not perhaps received the attention it deserves, and serves as a useful introduction to the subsequent articles showing the real position of the middleman and the relation of the costs of distribution to the course of prices. Many clumsy, unbusinesslike and costly methods still persist, and the steps taken to improve them are here traced. The slow progress in such an acknowledged reform as selling livestock by weight is acknowledged, and the many efforts, not always successful, to extend modes of co-operation and of combination among farmers should be studied in the light of the striking calculation reproduced, which suggests that more than a fourth part of the whole revenue from the produce sold off the agricultural land is absorbed in the cost of conveyance, distribution and sale. The carefully compiled data which these suggestive articles afford are no less useful to-day than when first written.

Since a primary object of all agricultural enterprise is the production of food, the statistical reader will note the estimates which this volume offers as to the extent to which—even under all the handicaps encountered in these days of lowered values and enormously enhanced oversea competition—the farmer still provides quite half the requirements of our swollen population. The details were shortly shown in a recent issue of this *Journal*, and will be welcomed in the more permanent form, as rightly finding space among this collection of thoughtful essays on agricultural problems which have lost none of their urgency, and on which clear thinking is more than ever seriously demanded on the part of all concerned for the well-being of our primal industry. P.G.C.

6.—*British Railways: a Financial and Commercial Survey.* By W. R. Lawson. xxxii + 320 pp., 8vo. London: Constable and Co., 1913. Price 6*s.* net.

Quite recently there has appeared a whole batch of books on railway questions, three or four books within the last three or four months. The quantity is all that can be desired; the quality, unfortunately, leaves something to be desired. Mr. Lawson, as we learn from the title-page of the present work, has written on "American Industrial Problems," "British Economics," "Modern

Wars and War Taxes," "Canada and the Empire," "John Bull and his Schools," etc., a somewhat miscellaneous list. As Chairman of the Railway Shareholders' Association he now, not unnaturally, writes a book on British railways. Its contents are also somewhat miscellaneous. In fact, it might be described as a work of the haggis variety. It is divided into six books—financial, historical, technical, commercial, administrative and political. All the six books are quite readable. None of them is made specially valuable by originality either of matter or of thought. None of them is accurate. In fact, they suggest a wistful comparison with the Sibylline books, which grew more valuable as they became fewer. We have marked in the course of our perusal a mass of errors, which it would be tedious and unprofitable to enumerate. Let one paragraph suffice. Mr. Lawson says (page 167):—

"In sharp contrast to the 'cost of service' theory of rate-"making there is one that charges according to the value of the "goods, bulk and weight being also, of course, taken into account. "This may be distinguished as the *ad valorem* theory, and it has, "perhaps, had most practical influence on existing rates. Our "whole classification system has been built up on it—first, by the "railway companies themselves, next by the Clearing House, and "finally by the legislation of 1888–94. Classification is an indirect "form of rate-making. It is just as easy to change a rate by "shifting the commodity into a higher or lower class as to alter "the rate itself. Under present conditions it may be even easier."

One naturally asks—(1) How can a theory which takes account of bulk and weight, which are purely "cost of service" considerations, be in sharp contrast to a "cost of service" theory of rate making? (2) What is the meaning of saying that our classification system has been built up by the legislation of '88 and '94, seeing that the Act of '88 only indirectly touched classification, and the Act of 1894 had nothing whatever to do with it.? (3) How does Mr. Lawson reconcile the last two sentences with the fact that the Clearing House classification is subordinate to the statutory classification, and that the railway company cannot—and, indeed, no authority less than Parliament itself can—remove any article into a higher clas than that in which the statute itself has placed it?

On page 33 Mr. Lawson writes:—

"That the railway companies of the United Kingdom should "carry on an average only 3⅓ tons for every mile they run would "be a startling announcement to make at a meeting of railway "shareholders, but here are the official figures by which one may "check the calculations for himself."

A table is accordingly constructed, showing that by dividing the total tons carried by the total mileage of the trains that carry them a quotient of 3·34 tons is produced. The figure would certainly startle a railway shareholder. But if he were a person of average intelligence he would probably, when he got over his astonishment, proceed to ask whether the average ton on English railways only travelled 1 mile, and then to observe that, if the average ton travelled 33 miles, that would mean 100 tons per train, if it travelled 50 miles that would mean 167 tons per train, and so forth. Having made this intelligent observation, he might not perhaps be instantly converted to a belief in the necessity of compelling his directors to compile and publish ton-mile statistics. But at least he would probably be disinclined to agree with Mr. Lawson in regarding these figures as merely "ethereal units," and be convinced that figures which took no account of distance were kittle cattle for even a chairman of Railway Shareholders' Associations to deal with.

Mr. Lawson is whole-hearted in his disapproval of railway servants who attempt, or indeed desire, to increase their wages or better their conditions of employment. We can therefore unreservedly commend his book to the perusal of the gentlemen who from time to time write to the newspapers under pseudonyms of "Disgusted Shareholder," "Old-fashioned Conservative," and the like. W.M.A.

7.—*Germany's Economic Progress and National Wealth,* 1888–1913. By Dr. Karl Helfferich. viii + 124 pp., 8vo. Berlin: Georg Stilke, 1913.

This is an English version of the section contributed by Dr. Helfferich, who is a Director of the Deutsche Bank, to a volume on German "Social Culture and Economic Development" during the past twenty-five years, issued in commemoration of the semi-jubilee of the Emperor William II. It is a sketch of the commercial and industrial progress of Germany during a period in which (to quote the pleasingly quaint phrasing of the Introduction), "enjoying the protection of peace and working with unresting, unflagging energy of head and hand, the German people have made up for the centuries lost in impotence and self-destruction; they have broadened all the conditions of their life from a contracted narrowness to an undreamt-of expansion; and, all things considered, they have achieved an advancement such as, compressed within so brief a time, the history of nations can hardly parallel."

The statistical criteria of progress which are applied by the author are, in the main, those ordinarily employed—population and vital statistics, production (crops, live-stock, coal, iron ore, pig iron and steel), consumption (grain and potatoes, meat, sugar, some colonial products), foreign trade, post-office business, railway traffic and mercantile marine. An attempt has been made to give in each case comparative figures covering a period as nearly as possible coincident with the reign of the present Emperor, but the coincidence is frequently far from exact. Thus statistics showing the changes in the numbers of persons employed in various branches of industry are available only for the period 1882–1907, and comparative figures of railway capital and traffic are given only for the years 1895 and 1910. Incidentally it may be noted that the latest figures quoted for meat consumption in the United Kingdom are for 1904. It is natural that in a work of this kind, which is in the nature of a panegyric, emphasis should be laid chiefly on those branches of economic activity in which Germany's development has been more marked than that of its chief competitors, or its superiority over them is most pronounced; but this tendency has some curious results. It is no doubt true, as Dr. Helfferich points out (pp. 50–51), that the German statistics of production and consumption are far from complete, and that such as exist are not altogether satisfactory; but not all that exist are utilised, and whilst international comparisons are made in some cases they are ignored in others. Thus statistics illustrating the growth of the coal and iron industries of Germany and certain other countries are set out at length, but the German cotton industry is dismissed in a small paragraph on p. 91 and two lines on pp. 66 and 67 (no data for other countries are given); there are no references to the woollen and silk industries, except some export figures on pp. 66 and 67; and shipbuilding is totally ignored.

There is a useful sketch (pp. 21–49) of the recent technological progress and changes in industrial organisation, but the most interesting section of Dr. Helfferich's book is that (pp. 93–124) in which he endeavours to estimate Germany's capital wealth, and total annual income and addition to capital made therefrom. On the basis of the income-tax returns he arrives at an approximate estimate of total annual income of 2,000 millions sterling; for international comparisons the year 1908 is taken, the result being an average income per head of population of 815 marks for the United Kingdom (Mr. Chiozza Money's total figure of 1,710 millions sterling being adopted), 555 marks for Germany, and 514 marks (Leroy-Beaulieu's estimate) for France. The aggregate wealth of Germany is calculated at 15,000 millions sterling (oversea investments of all kinds being reckoned at 1,000 millions sterling), and the annual addition thereto at about 500 millions sterling. The data utilised are chiefly the property-tax returns, railway capital returns, insurance values of various classes of property; estimates of this particular kind have always a large speculative element, but the calculations before us appear to have been carefully made and to be as reliable as can reasonably be expected. In respect of the income-tax returns, Dr. Helfferich has given some data relating to the distribution amongst the various income-classes of the total income thereby brought under review; but only in this connection does he touch upon one of the most important questions related to his main subject. It is possible that in the volume of which it originally formed part the economic and social progress of the German *people* was discussed; but in this separate publication Dr. Helfferich's account presents a picture which is very incomplete. It shows an astonishingly rapid growth in total income and aggregate wealth; it says practically nothing of the reaction of that movement on the conditions of the life and labour of the industrial and agricultural working classes, and of their share in the enhanced production and accumulated wealth. P.A.

8.—*The German Cotton Industry.* By R. M. R. Dehn, B.A. Gartside Report, No. 10. viii + 104 pp., 8vo. Manchester: University Press, 1913. Price 2*s.* net.

This book is the third Gartside Report which deals with the cotton industry, and the first work in English devoted to the cotton trade of Germany since Dr. G. von Schulze-Gävernitz's well-known book, *Der Grossbetrieb*—which is in the main a study of the relative positions of England and Germany—was published in an English translation in 1895, though a large amount of information about the German cotton industry is contained in Professor Chapman's *The Cotton Industry and Trade* (1905) and in Dr. Copeland's *The Cotton Manufacturing Industry of the United States* (1912).

Mr. Dehn gives a clear and readable account of the present condition of the industry in Germany, together with a brief historical sketch of its development, and draws attention to the more important differences between German and English conditions. The first chapter is historical and treats of the vicissitudes of the industry from the fourteenth century, when Ulm and Augsburg achieved commercial eminence by the manufacture of "barchent" (a mixed linen and cotton cloth), to the present day, "when every branch of the industry of any importance is represented on German soil."

The second chapter deals with the local distribution of cotton manufacture in Germany. Unlike the English cotton industry, which is concentrated in Lancashire and parts of the neighbouring counties, the German industry is dispersed over several States. It is possible, however, to group it in three divisions: the North-Western, comprising Rhenish Prussia and Westphalia; the Central, comprising Lower Silesia, Saxony and part of Bavaria; and the Southern, which includes Suabia, Würtemberg, Baden and Alsace. Broadly speaking, one finds the finest spinning and weaving in Alsace, the coarsest in Rhenish Prussia and Westphalia, and the greatest production of coloured goods in Saxony.

The decentralisation of the industry is due partly to the political divisions which formerly split Germany into a number of independent units, and partly to geographical factors—particularly the necessity of establishing mills where water power could be utilised. While there is no such local specialisation in Germany as in Lancashire, certain places have become famed for particular goods with which their names are intimately associated. Thus Chemnitz is the centre for cotton hosiery; Werdau and Crimmitschau for "vigogne" yarn (a cotton yarn spun on the woollen system); München-Gladbach for cotton buckskins, blankets and flannelettes; and Mülhausen for cotton prints.

In the next chapter Mr. Dehn gives a sketch of the working conditions of the industry, describing the style and cost of erection of factories, the relative cost and efficiency of steam, water and electrical driving, the cost of transporting the raw material, and the cost and general character of the plant. The principal classes of work done are indicated, and the chapter concludes with an account of the *personnel* of the factories and an examination into the standard of efficiency attained by the operatives.

While there is much of interest and value in this chapter, there are several obvious shortcomings. Mr. Dehn has not availed himself of the published statistics showing the number of separate spinning mills and weaving factories, the number of combined spinning and weaving concerns, and the average number of spindles and looms respectively per factory, which would have enabled him to make some interesting comparisons between Germany and Lancashire. There is no more than a hint of the proportion of preparation machinery to spinning spindles, nor are the actual numbers of mule and ring spindles given, though figures are available for 1907. It would, further, have been an advantage if figures showing the imports and exports of raw cotton, yarns and fabrics had been included, together with some account of the consumption of raw cotton and the output of the spinning industry, material for which is to be found in the report of the German Industrial Census of 1907. In treating of the *personnel* of the mills Mr. Dehn makes no mention of the total number of workpeople employed in the industry nor of the proportion of men, women and young persons. An interesting point that might have been noticed in this connection is the employment of women as piecers on mules.

Passing from the working conditions, Mr. Dehn gives an interesting description of the commercial organisation of the industry, dealing successively with the marketing of raw cotton, yarn and the different kinds of fabrics. Then follows an adequate account of the several classes of employers' associations and the not very highly organised trade unions (which Mr. Dehn rather unfortunately calls "trades-unions").

The book is brought to a conclusion with a chapter on the lot of the operative, in which a comprehensive survey is made of working-class conditions, and to which a table showing the wages earned in the principal cotton manufacturing districts is appended. The account might, however, have been made somewhat fuller by a reference to the Report of the Board of Trade on the Cost of Living in Germany, especially the parts dealing with the standard and cost of living of the working classes in Mülhausen and in the textile towns of Rhenish Prussia and Saxony.

On the whole, Mr. Dehn's work is a valuable contribution to the literature of the cotton industry and should be of use to those interested in the comparative study of the subject. S.L.B.

9.—*Théorie de la Valeur.* Par Christian Cornelissen. Deuxième Edition. 480 pp., 8vo. Paris: Giard et Brière, 1913. Price 10 frs.

The theory of value has been described not inappropriately as the chief theory of Economics; and the full exposition furnished in this volume, both in the negative criticism of the extravagant or defective views of earlier writers, and in the positive statement of the author's own more comprehensive and less unbalanced opinion, tends to place the theory at a central point, to which on the one side the production of wealth may be considered to lead up, and from which on the other the consumption of that wealth may be regarded as conducting down. In this book, which, so far as the substance of the theory itself is concerned, is, we are told, unchanged from the original form of the first edition of ten years ago, blame is dealt impartially to two contending schools. The sub-title of the treatise indicates that the theories of Rodbertus and Karl Marx, and of Stanley Jevons and Boehm Bawerk, are "refuted" by its arguments; and the condemnation of the earlier pair of authorities extends to the more famous and more orthodox economists like Adam Smith and Ricardo, who supplied the origin of the idea developed so perversely by the German socialists into the crude impossible notion of value as "congealed labour." Marx himself, however, this essay shows, was compelled in the end to abandon his position and admit the influence of other forces, just as Boehm Bawerk has in his turn been driven to recognise that the "cost of production" may have an effect on value in addition to, if not independent of, that factor of utility to which he attributed at starting dominant or entire control.

Other writers have anticipated the main conclusions of this book in seeking and discovering a complete explanation of the theory of value in the mutual influence of forces actuating the buyers and the sellers or, as it should perhaps be more accurately expressed, impelling or restraining the producers and consumers. But there is a refreshing novelty in the attitude from which the problem is approached, and in some details of the mechanism by which its solution is attained. The able learned author of this clear persuasive treatise thinks that Jevons and the Austrians have erred no less conspicuously than Marx, by deserting the concrete facts of the actual market, and substituting in their place metaphysical and abstract figments of the imagination; and his criticism of the minute quantities by which their theory of final utility postulates that increments and decrements are added and subtracted is certainly not irrelevant or undeserved. His distinction too of three kinds of value is no less apt. There is a value in use applicable to the action of consumers, and connected with the theory to which we have just referred. There is also a value of production, guiding producers, and emphasised exclusively by the older economists in their notion of cost of production; and there is finally a value in exchange which should be separated from the value last mentioned but was in effect identified with it by the original exponents. It is in this value in exchange that the joint influence, acting and reacting on one another, of the motives governing either party to the bargain is discovered; and our author is also careful to point out what his predecessors had not always been at pains to recognise, the difference, namely, between subjective and objective estimates. In these ways he imparts attractiveness and adds exactitude to the discussion.

L.L.P.

10.—*Versicherungswesen.* Von Alfred Manes. Zweite, umgearbeitete und erweiterte Auflage. xiv + 485 pp., 8vo. Leipzig and Berlin: B. G. Teubner, 1913. Price 11 marks.

This is the second edition of a work originally published in 1904, and intended to serve as an introduction to the science and art of insurance. In the decade which has elapsed since then the law and practice of insurance have undergone great changes and an immense extension throughout the world, and Professor Manes, whose authority on this subject is generally recognised, has endeavoured, in the volume before us, to take all these developments into account. The result is a work which must, we think, be widely accepted as a standard text-book, of great value to the beginner and of substantial interest to the advanced student, even though its introductory character is still maintained.

In the first part of his work (pp. 1–220) Professor Manes discusses a number of questions relating to the principles and economic importance of insurance (it should be noted that "social insurance" [*Arbeiterversicherung*] is deliberately left outside the scope of the book) and sketches its development. In this latter connection there are some interesting statistical tables on pp. 48–57, based mainly on the work of Iranyi, which show, *inter alia*, that the total amount of life insurance policies in force in eighteen European countries, the United States, Canada and Japan, rose from about 4,400 million sterling in 1900 to 7,370 million sterling in 1910, insurances in United States companies representing rather more than three-fifths of the total in each year, their proportion having increased slightly in the decade. Fire insurance also shows a very striking advance, the proportionate rise in the ten years' interval in the total premiums annually paid being most noteworthy in the case of the United States (19·7 millions to 42·5 millions sterling), France (4·5 millions to 10 millions sterling) and Russia (3·7 millions to 8·7 millions sterling); the United Kingdom companies' movement has been from 21 millions to about 28 millions sterling. Accident and employers' liability insurance has also extended very rapidly, in part as a result of legislation, and in this the United Kingdom still headed the list in 1910, the premiums paid having risen from 3 millions sterling in 1900 to 9·8 millions sterling in the later year; the United States' advance was from 2·3 millions to 9·2 millions sterling, whilst France (1·9 millions to 4·4 millions sterling) showed in this case greater progress than Germany (1·8 millions to 3·9 millions sterling). In further sections of this part Professor Manes examines insurance methods and forms in general, including the relative merits of State and private action, and agency systems; the technique of insurance, including a short account of its actuarial bases and accounting systems; and the relation of the State to the insurance companies, his bias being in favour of State supervision as established in the German Empire, though the "freedom with publicity" system adopted in the United Kingdom meets with some commendation.

The second part of the book (pp. 222–470) is devoted to a detailed survey of the various branches of insurance. This is very comprehensive, ranging from life and marine insurance, through insurance against damage by hail, to burglary insurance, provision against errors in telegrams or delays in their delivery (introduced in Denmark in 1908), church-clock insurance (Austria-Hungary), compensation for economic loss arising from political prosecutions (a peculiarity of Russia), and schemes for insurance against celibacy and divorce. In the case of all the more important branches, Professor Manes sketches the historical development and the general principles and methods adopted, gives statistical illustrations and examples of the rates of premium in force, and indicates the chief problems involved. This second part of the book (which has naturally undergone the larger change from the earlier edition) is closely packed with information skilfully presented; the examples are drawn mainly from Germany, but much material relating to other countries is utilised. It remains only to add that there is a good table of contents and a comprehensive index. P.A.

11.—*Essays in Taxation.* By Edwin R. A. Seligman, McVickar Professor of Political Economy in Columbia University. 8th edition. xi + 707 pp., 8v. London: Macmillan and Co., 1913. Price 17*s*. net.

The successive editions of this work have made Professor Seligman's discussion of the history and philosophy of taxation a necessary part of the equipment of every student of public finance, and we do not propose in this short notice to do more than draw attention to those sections of the present edition which are of special interest to English readers. The author notes that English economic literature—at all events, until the appearance of Professor Bastable's *Public Finance*—has not been very fortunate in its systematic study of fiscal problems in comparison with the work on this subject performed in France and Germany, to which we may add America. One of the reasons he gives for this relative inferiority is, however, consoling, for he considers that it is partly due to the superiority of our fiscal system, which has contributed to hinder the growth of theory. It is in the "practical working out of political ideals that England has usually led the way"; and Professor Seligman, in surveying the changes effected by the Budgets of Sir William Harcourt in 1894 and Mr. Lloyd George in 1909, is of opinion that in practical financial reforms Great Britain still occupies the first place; that she is "putting herself at the head of those nations which are seeking to realise the importance of the newer considerations in the theory of taxable capacity";

and that, "taking it as a whole, the English system is in advance of that found in any other leading country." There can, we think, be no doubt that this praise—qualified however by the remark that the question of the relation between general and local taxation is "the only important point on which that system is still defective"—is well deserved. But it seems to depend on the acceptance of a theory of incidence, as regards direct and indirect taxation, which is not quite easy to reconcile with the considerations put forward in the very interesting section on "Modern problems in taxation." Until the "diffusion" and "absorption" theories have been more fully worked out in practice it seems to us impossible to appreciate their bearing upon the actual problem of the raising of revenue with due regard to the "faculty" of the taxpayer. Professor Seligman lays stress upon the fact that "everywhere personal taxation is giving way to impersonal taxation," that state and local taxes, even in England, "with the exception of a single schedule of the income tax, are slowly coming to be imposed on things rather than on persons." We should have thought, on the contrary, that the whole tendency, and one of the principal merits, of recent fiscal legislation had been to impress on the taxpayer that taxation however disguised fell upon him as an individual. If the "conception of the social *versus* the individual basis of taxation," the "societary aspect of taxation," which is insisted on as a new supplementary principle, means that individuals are more and more to be called upon to sacrifice their means for social ends, there will be no dispute; if it is suggested that in some manner taxation (such as that on American "corporations") will come to be drawn from wealth and profits without a direct and perceptible effect upon individuals, we are unable to follow the argument. It is probable, however, as Professor Seligman says, that the "most fruitful work of the future in the science of finance will consist in the elaboration in detail of the conditions and limits" of these theories.

B.M.

12.—*Other New Publications.**

Ballen (*Dorothy*). Bibliography of Road-making and Roads in United Kingdom. With Introduction by Sir George Gibb. xviii + 211 pp., 8vo. London: P. S. King and Son, 1914. Price 15*s*. net.

[A revised and much enlarged edition of the bibliography compiled by Mr. and Mrs. Webb in 1906, and undertaken at their suggestion. In preparing the book it was found necessary to omit certain classes of documents, owing to considerations of space; and apart from these the bibliography is as nearly complete as the materials within reach will allow.]

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* See also "Additions to the Library," page 247, *sqq*.

Bellom (*Maurice*). Les Fonctionnaires civils et les risques de guerre. Une réforme nécessaire. 24 pp., 8vo. Paris: Arthur Rousseau, 1913.

[Deals with the payment of pensions to those in civil employment or their dependents who, in case of war, may be called to serve in the army, and be killed or wounded. The author explains how the matter is arranged in Austria and Germany, and suggests reforms in France.]

——— La Vérification des Bilans dans les Sociétés anonymes. Étude suivie d'une proposition législative. 34 pp., sm. 8vo. Paris, 1913.

[A study of the difficulties in verifying the balance sheets of joint stock companies in France, with suggestions for the improvement of existing methods of auditing such accounts.]

Boren (*Pierre*). Les Applications mathématiques à l'Economie politique. 204 pp., 8vo. Lausanne: F. Rouge and Co., 1912.

[A description of the different ways in which writers of various countries have applied mathematical methods in economic studies. After some general discussion, the writer passes in review a series of authors, beginning with Jean Ceva, of Mantua, whose work was published in 1711, and ending with Pareto. Of English writers, only Jevons receives special notice, though Marshall and Edgeworth are mentioned in passing.]

Carr (*A. S. Comyns*), *Garnett* (*W. H. S.*) and *Taylor* (*J. H.*). National Insurance. With preface by the Rt. Hon. D. Lloyd George, M.P. 4th edit. xliii + 1284 pp., 8vo. London: Macmillan and Co., Ltd., 1913. Price 15*s.* net.

[The first edition of this book was reviewed in the *Journal* for April, 1912. In the present edition the provisions of the Amending Act of 1913, now in course of coming into operation, have been incorporated, and their effect upon the principal Act is shown. The numerous regulations, tables and decisions issued by the various departments charged with the administration of the Acts have been collected into groups, and as far as possible collated. To make room for this new material, the whole of the introductory chapters have been omitted, but the authors hope later to issue a separate volume describing the law and practice of National Insurance for the guidance of those concerned. There is a very full and useful index.]

Laborlère (*Marcel*). Mouvements de l'or aux États-Unis (1890-1911), et Tableau des mouvements de l'or dans le monde en 1911. . . . . 29 pp. + folded tables, 8vo. Coulommiers: Paul Brodard, 1913.

[A statistical study of the movements of gold in the United States from 1890 to 1911, and of recent legislation passed to regulate it. The influence of the movements of the precious metals on prices and the general well-being of the people is also examined. There is an appendix of tables and a bibliography.]

Wacha (*D. E.*). Rise and Growth of Bombay Municipal Government. viii + 455 pp., sm. 8vo. Madras: G. A. Natesan and Co., 1913. Price 2 rupees.

[The contents of this book originally appeared as a series of articles contributed by the author to the *Bombay Municipal Journal* in 1901 and 1902. They were widely read at the time, and have been put into book form for permanent reference. Mr. Wacha gives a full and clear account of the municipal government of Bombay from its inception in 1782 to present times.]

Zizek (Dr. Franz). Statistical averages: a methodological study. Authorized translation with additional notes and references by W. M. Persons. ix + 392 pp., 8vo. New York: Henry Holt and Co., 1913. Price \$2 50c.

[The original German edition of this book was reviewed in the *Journal* for March, 1909. The English translation has been undertaken by Professor Persons, because the book appeared to him to meet the requirements of a non-mathematical text-book on statistics better than any work available in English. A few additions have been made to the translation in the way of footnotes, and the bibliography has been extended, particularly in regard to books and periodicals useful to American readers.]

U.S.A. Annals of the American Academy of Political and Social Science. November. 1913. Reducing the Cost of Food Distribution. 306 pp., 8vo. Philadelphia: American Academy of Political and Social Science, 1913.

[This volume contains over thirty papers by different authors, dealing with different phases of the question of reducing the cost of food distribution. They are grouped under the six following heads:—Parts 1. More efficient distribution and conservation of foodstuffs; 2. Lower cost through the middleman and retailing; 3. Lower cost through municipal markets and direct marketing; 4. Lower cost through farm credits and advertising; 5, Lower cost through co-operation; 6, Elements in a constructive programme for lower cost of distribution. A useful index for the whole volume is provided.]

The Land and the People. *The Times* Series. 90 pp., sm. 8vo. London: John Murray, 1913. Price 1s. net.

[A reprint in handy form of eight articles which appeared in *The Times*, under whose auspices this book is issued. The subjects dealt with include agricultural production, labourers' wages, housing, small holdings and land ownership; and there is also a comparison with foreign countries.]

CURRENT NOTES.

The trade returns for the past month are not entirely satisfactory, considering that the month had one working day more than December, 1912. Imports show a decrease of nearly three millions sterling, owing largely to lower prices for rubber and grain; exports of home produce and manufactures advanced by 1,867,882*l.* The figures for the year, however, are very satisfactory. They are the highest on record, and for the first time exports of the produce and manufactures of the United Kingdom have reached a total of 500,000,000*l.*, showing an increase of 38,237,977*l.* over 1912. The subjoined figures compare the year with that ending December, 1912:—

[000's omitted.]

Imports.	Twelve months ending December, 1913.	Twelve months ending December, 1912.	Increase (+).
Imports, value c.i.f.—	£	£	£
I. Food, drink and tobacco	290,397,	280,588,	+ 9,809,
II. Raw materials and articles mainly unmanufactured	281,924,	275,667,	+ 6,257,
III. Articles wholly or mainly manufactured	193,606,	185,467,	+ 8,139,
IV. Miscellaneous and unclassified (including parcel post)	3,106,	2,918,	+ 188,
Total merchandise	769,033,	744,640,	+ 24,393,
Imports of bullion and specie	74,029,	69,467,	+ 4,562,

[000's omitted.]

Shipping.	Twelve months ending December, 1913.	Twelve months ending December, 1912.	Increase (+).
	Tons.	Tons.	Tons.
Total, British and foreign, *entered* with cargoes	49,063,	46,348,	+ 2,715,
Total, British and foreign, *cleared* with cargoes	67,820,	62,037,	+ 5,783,

[000's omitted.]

Exports.	Twelve months ending December, 1913.	Twelve months ending December, 1912.	Increase (+) or Decrease (−).
Exports of produce and manufactures of the United Kingdom, value f.o.b.—	£	£	£
I. Food, drink and tobacco	32,608,	32,686,	− 78,
II. Raw materials and articles mainly unmanufactured	69,896,	59,417,	+ 10,479,
III. Articles wholly or mainly manufactured	411,572,	385,028,	+ 26,544,
IV. Miscellaneous and unclassified (including parcel post)	11,385,	10,092,	+ 1,293,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	15,941,	15,094,	+ 847,
II. Raw materials and articles mainly unmanufactured	64,056,	67,286,	− 3,230,
III. Articles wholly or mainly manufactured	29,520,	29,189,	+ 331,
IV. Miscellaneous and unclassified (including parcel post)	138,	168,	− 30,
Total, British, foreign and colonial	635,116,	598,960,	+ 36,156,
Exports of bullion and specie	62,142,	64,871,	− 2,729,

Mr. Sauerbeck's index-numbers of prices for December, 1913, as given in the *Statist*, is 83·9, as against 83·3 in November, the average of the eleven years, 1867-77, being taken as 100. The index-number has shown a tendency to decline almost throughout the year. After rising to 86·7 in March it fell to 84·1 in June, recovered to 85·7 in September, declined to 83·3 in November, and closed the year at 83·9. That the fall was not greater was due mainly to the further rise in the price of animal food, and to the relatively short crops of textiles which caused the latter to be maintained at higher figures. Articles of food were 75·0, the same as in November, and materials 90·0 as compared with 89·4 in November. The *Economist* index-number stands at 2,623, as compared with 2,661 in November, 2,747 in December, 1912, and 2,586 in December, 1911.

According to the Board of Trade *Labour Gazette* the state of the labour market last November was as follows:—

	Trade Unions making returns. Net membership.	Reported as unemployed.	
		Number.	Percentage.
November, 1913............	967,361	19,668	2·0
October, 1913............	948,601	20,857	2·2
November, 1912............	887,350	16,142	1·8

Employment in November continued good on the whole. There was a further improvement in the iron and steel industry, except in Scotland, and in the shipbuilding and glass trades, while the tinplate industry also showed an upward movement. On the other hand, the number of pig-iron furnaces in blast continued to decline. There was also a falling-off in most of the textiles, especially in the woollen and worsted trades and in the weaving branch of the cotton industry. The seasonal decline in the building and brickmaking trades continued, and there was a further seasonal improvement in the printing trades. Coal mining and engineering continued active. Compared with the high level of November, 1912, employment generally showed some falling-off, which was particularly noticeable in the pig-iron, iron and steel, and tinplate trades.

At a meeting of the Section on Vital Statistics of the American Public Health Association, held at Colorado Springs last September, Dr. Wilbur is reported as speaking in high terms of the work of the Special Committee of the Royal Statistical Society on Still-births in relation to Infantile Mortality, which was undertaken at the suggestion, and under the active guidance, of Dr. Dudfield. A number of resolutions, proposed by Dr. Wilbur, were adopted. It was resolved, *inter alia*, that thanks were due to the Royal Statistical Society and to Dr. Dudfield; and Dr. Dudfield's recommendations to the International Statistical Institute at the session held in Vienna (September 7—13, 1913) were endorsed by the Association. The hope was expressed that the International Statistical Institute would take the initiative in bringing about international uniformity in methods of registration, definition, and statistical treatment of still-births; and, finally, it was resolved that the present committee on the subject be continued by the Section on Vital Statistics, with the request to keep the Section advised as to the progress made abroad and in the United States, and the possibility of co-operation in the adoption of additional rules or the revision of the present rules relating to still-births.

An investigation by Mr. Arthur Greenwood into the health and physique of school children, based on the reports of school medical officers, has been published for the Ratan Tata Foundation by Messrs. P. S. King and Son (1s. net). Mr. Greenwood has been at pains to collect data respecting the height and weight of some 800,000 children from the scattered reports of school medical officers, and has founded on these averages and index-numbers for the different districts to which the individual reports relate. The well-known contrast between heights and weights in the schools of poorer and more prosperous districts is very clearly brought out by several tables. Two forms of index for "nutrition" were tested, the simple ratio of weight to height, and the ratio of the cube root of the weight to the height. The two seem, curiously enough—though no reference appears to be made to the point in the text—to lead to divergent results: the simple ratio is lower, the cube root ratio is higher, for the poorer children, judging from charts and data relating to children at Newcastle (pp. 37–39) and Leeds (p. 94). Comparative data from Bradford for the years 1908-11 are of interest as tending to show that school treatment and the feeding of school children has brought about an appreciable improvement in height and weight, though a longer period will of course be necessary adequately to test this conclusion. The data respecting half-timers are also discussed at some length. In this as in some other cases the significance or otherwise of the results is uncertain as no measures of dispersion are given, nor does it appear to be possible to form them owing to the manner in which many reports give only averages. The report indeed brings out incidentally how much some more definite central guidance is needed. Mr. Greenwood seems to be fairly content with the data, regarding them (p. 3) as sufficiently accurate for the purpose in hand. But the facts that he himself states leave the reader somewhat disquieted. The fraction of an inch to which readings were taken appears to be quite uncertain; it seems further to be uncertain whether some observers, instead of reading, *e.g.*, to the nearest inch, have not always read to the next highest or the next lowest unit; it does not seem to be certain whether heights have always been measured without boots or weights in ordinary indoor clothing, and so forth. There are further divergences between the practice in different reports as regards the form of tabulation of the data. The fact that Mr. Greenwood has felt himself justified in rejecting certain discrepant records does not add to the reader's confidence. A little effort on the part of the Whitehall authorities ought to be able to reduce these uncertainties and discrepancies by giving clear and definite instructions as regards the taking of measurements and the form of tabulation to be adopted in medical officers' reports.

In an Appendix to the Annual Report for 1912 of the Chief Medical Officer of the Board of Education, just issued (Cd.–7184, 2*s.* 6*d.*), specimen tables are in fact suggested for the returns as to physical condition of children (clothing, cleanliness, nutrition, nose and throat, eyesight, &c.), but no draft table is given for the weight and height returns, nor definite instructions for the mode in which the measurements should be taken. A draft table, showing that the returns were to give the complete frequency distribution, and specifying the class limits to be taken, might well have been added. It is not clear why it should be, as the Chief Medical Officer complains, "difficult to secure uniformity of method" (p. 397). Attention is directed, it may be mentioned, to Mr. Greenwood's work as affording some standard for comparison as regards heights and weights. The great bulk of the Report deals, as do previous issues, with the medical work, the returns as to defective vision, tuberculosis, heart disease and rheumatism, epileptic children, medical treatment and dental treatment. Many excerpts are given from the reports of school medical officers as to the causation of the defects met with, and are of interest as showing, in many cases, the diversity of the prevailing views. The fact that more than one medical officer relies on "family history" as helping in the *diagnosis* of pulmonary tuberculosis (p. 74) may perhaps be noted. The dental treatment appears to have been especially well organised at Cambridge, and the records there to have been very carefully kept. During the five years 1907-12 it is stated the percentage of decayed teeth in children of the borough aged 5 fell from 41·0 to 31·6 per cent.; in children aged 6 from 49·4 to 40·0; in children aged 7 from 55·3 to 45·5; and in children aged 8 from 59·2 to 44·7; and in children aged 9 from 70·6 to 54·0 per cent. (p. 193).

A report has been issued by the Labour Department of the French Republic dealing with an inquiry into the proposed adoption of the *semaine anglaise*, *i.e.*, the shortening of working hours on Saturdays either by one or by two hours. In the course of the report it is pointed out that although it was known that this reduction had not hitherto been widely adopted in France, as was shown by a special inquiry made in 1903, nevertheless, at the suggestion of the "Commission permanente du Conseil supérieur "du Travail," and in conjunction with it, a fresh inquiry was undertaken. A *questionnaire*, requiring information as to the prevailing practice, and inviting opinions on the adoption of shorter hours on Saturdays, was addressed to a number of bodies, viz., chambers of commerce and advisory boards of arts and manufactures, labour exchanges, "departmental" labour committees, and associations of employers and of employees. The information asked for was classified in respect of women employees, children and male adults, and returns were made under these separate heads. In the case of women employees, 881 bodies, out of a total of 1,288, made returns, and of these 171 stated that the *semaine anglaise* was more or less in use in their districts or trades. These bodies consisted of 11 chambers of commerce, 5 labour exchanges, 26 employers' associations, 124 trade unions, and 5 "departmental" labour committees. 710 similar bodies stated that the *semaine anglaise* was not in use in their districts or trades. As regards children, 172 bodies, out of a total of 1,005, indicated the adoption of short hours, and 883 indicated the contrary; while as regards male adults, the figures, out of a total of 1,119, are 190 and 929 respectively. Figures are also given of opinions for and against the adoption of short hours. As regards women employees, out of 1,288 bodies, 541 declared in favour of the principle, and 455 against, while 286 expressed no view; as regards children, the figures are 567 for, 531 against, and 185 neutral; as regards male adults, 556 for, 634 against, and 92 neutral. The report should be read in conjunction with two reports on the subject made by the "Commission "permanente" to the "Conseil supérieur" of the Ministry of Labour. These reports, which are made by the "employee" and "employer" members of the Conseil respectively, indicate the lines upon which the Conseil were divided in regard to the proposed changes. The view of the "employee" members is, in regard to women and children (under 18), that the working day during the first five days of the week should remain fixed at 10 hours, while on Saturdays work should cease, without exception, at mid-day. As regards male adults, the first five days should remain as settled by past legislation, while on Saturdays, in industries determined by the "Conseil supérieur," work should cease all the year round, or during a part of the year, in the afternoon. The employers are unconditionally opposed to any compulsory reduction of hours.

The *Journal of Political Economy* of the University of Chicago for October and November, 1913, contains articles by Mr. James Dysart Magee on "Money and Prices." The problem considered is the relationship which exists between changes in the amount of money (in banks or in circulation), or changes in the amount of bank deposits on the one hand, and changes in general prices and changes in the prices of particular groups of commodities on the other hand. The study is primarily statistical—a study of what has actually happened; but the bearing of the results upon certain theoretical points of monetary discussion is briefly indicated. The following conclusions, referring, of course, only to the periods and the price movements examined, are drawn, viz. :—(i) The relation of price changes to changes in the amount of money in circulation and in banks, and in the amount of deposits in banks varies with different groups of commodities. Moreover, in any particular group of commodities, the relation may be different when weekly, monthly, and yearly averages are considered. (ii) In no case was complete correspondence found between a price movement and the movement of money or deposits in banks, or of money in circulation. (iii) In general, the correspondence is greater between price movements and the movement of money or deposits in banks, or of money in circulation, when the averages used cover longer periods than when they cover shorter periods. (iv) Some of the price movements in local markets show more correspondence with the movement of money and deposits in the local banks than is shown in the comparison of general prices throughout the country with the money in circulation in the whole country. (v) The causal influence runs from money in circulation or in banks to prices more frequently than the reverse. On the other hand, the causal influence runs from prices to bank deposits more frequently than the reverse.

The *Geographical Journal* for January contains a Paper by Mr. B. C. Wallis on "Nottinghamshire in the Nineteenth Century," dealing with the geographical factors in the growth of the population, the environment of which is considered both from a static and a dynamic point of view. It is shown how world changes in agriculture have had an effect upon the population similar to that of railways, and have resulted in a decline of population in the rural parishes. The Paper is well illustrated by diagrams, and there are some interesting tables.

The first number has been issued of the *International Review of Commerce and Industry*, which is appearing monthly under the editorship of Mr. T. Swinborne Sheldrake at the price of 2*s*. The first number contains, *inter alia*, an article by Professor W. J. Ashley on "Commerce and the Universities." The publishers are Messrs. L. Upcott Gill and Son, Ltd.

It is announced that a course of six lectures on "Problems of "Trade Union Organisation" is to be given at the London School of Economics, Clare Market, Portugal Street, Kingsway, W.C., by Mr. Sidney Webb, LL.B., Professor of Public Administration in the University of London, assisted by Mr. W. Stephen Sanders and Mr. C. M. Lloyd, B.A., on Tuesdays, at 8 p.m., beginning January 27, 1914.

The New Year's Honours List includes the names of Mr. Timothy A. Coghlan, I.S.O., Agent-General for New South Wales in London (Knight Bachelor), and Mr. Charles Ernest Dale, Treasurer of Nigeria (C.M.G.).

Mr. G. Randone, Controller of the Statistical Department of the Government of Egypt, has retired after thirty years' service, and has been succeeded by Mr. J. I. Craig, who was formerly director of the Meteorological Service in the Survey Department.

The death is announced of His Excellency Nicolas Troïnitsky, who was an Honorary Fellow of the Society since 1890. M. Troïnitsky held the office of President of the Statistical Council of Russia, and was formerly Director of the Central Statistical Committee of the Ministry of the Interior. He was a member of the Statistical Society of Paris, and a Vice-President of the International Statistical Institute. The death is also announced of Monsieur Sauveur, Secretary of the Ministry of the Interior and of Public Instruction in Belgium, Secretary of the Central Statistical Commission, and an honorary member of the International Statistical Institute.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Bankers' Magazine—

December, 1913—The gold reserve problem. Sir Edward Holden on national gold reserves.

January, 1914—Progress of banking in Great Britain and Ireland during 1913. No. 1. Capital and reserve funds. Callable capital in banks: *Palgrave* (*Sir Inglis*). The excessive cost of peace: *Croal* (*D. O.*).

Economic Journal. December, 1913—The pure theory of utility curves: *Johnson* (*W. E.*). Relation between wholesale and retail prices of food: *Bowley* (*A. L.*). The ancient coins and currency of China: *Waung* (*Chi Zung*). German experiments in fiscal legislation: *Cohn* (*Prof. G.*). English town development: *Tillyard* (*F.*). Index-numbers for working-class cost of living: *Wood* (*Frances*).

Financial Review of Reviews—

December, 1913—Land purchase dangers: a suggested solution: *Wright* (*Arnold*).

January, 1914—Rural cottages and public money: *Marlborough* (*His Grace the Duke of*), K.G.

Journal of the Institute of Bankers—

December, 1913—The President's inaugural address: *Goschen* (*Rt. Hon. Viscount*). The scramble for capital: *Milner* (*Rt. Hon. Viscount*). The loanable value of money: *George* (*E. M.*).

January, 1914—The daily money article. Lectures 1 and 2: *Duguid* (*Charles*).

UNITED STATES—

American Economic Review. December, 1913—The security holdings of national banks: *Hollander* (*Jacob H.*). The cost of government in Minnesota: *Robinson* (*Edward van Dyke*). The express charges prescribed by the Interstate Commerce Commission: *Field* (*Arthur S.*). Objections to a compensated dollar: *Patterson* (*E. M.*). Amortization: *Chandler* (*Alfred D.*).

American Journal of Sociology. November, 1913—The social waste of unguided personal ability: *Woods* (*Erville B.*).

American Statistical Association (*Quarterly Publications*). *No.* 103. *September*, 1913—Street traffic accidents: *Crum* (*Frederick S.*). The International Statistical Institute. XIVth session, Vienna, September, 1913: *Koren* (*John*). An index of changes in extractive industries: *Leonard* (*William E.*).

Journal of Political Economy. December, 1913—Uniform methods of railway accounting: *Nay* (*Frank*). Workmen's compensation in the United States: a review: *Downey* (*E. H.*). The United Shoe Machinery Company: *Roe* (*Richard*).

AUSTRIA—

Statistische Monatschrift. November, 1913—Die XIV Session des Internationalen Statistischen Instituts: *Meyer (Dr. Robert)*. Das 50 jährige Jubiläum der k.k. Statistischen Zentralkommission: *Meyer (Dr. Robert)*. Die Hauptergebnisse der ungarischen Volkszählung von Ende 1910: *Hecke (Dr. Wilhelm)*.

EGYPT—

L'Egypte Contemporaine. November, 1913—Traitement de l'enfance coupable ou moralement abandonnée: *Sami (Mahmoud)*. Chronique agricole de l'année 1913: *Jullien (L.)*.

FRANCE—

Bulletin de Statistique, Ministère des Finances. October, 1913—Le projet de budget pour l'exercice 1914. Monnaies françaises fabriquées depuis 1795. Évaluation des quantités d'or et d'argent employées par l'industrie de 1902 à 1911. Suède: Création d'un système d'assurances générales pour pensions de retraites.

Bulletin Mensuel, Ministère de l'Agriculture. November, 1913—La question agraire en Angleterre: *Savary (H. R.)*.

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December, 1913—La statistique internationale de l'assurance contre l'invalidité: *Bellom (Maurice)*.

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Revue d'Économie Politique. November-December, 1913—Le bassin de Briey et la politique de ses entreprises sidérurgiques ou minières: *Vignes (Maurice)*. L'alimentation populaire à Paris: *Feilbogen* (—). Intervention légale et contrat collectif du travail: *Piron (Gaëtan)*. Brisbane: Esquisse du développement d'une capitale coloniale dans l'Empire Britannique: *Schindler (Charles)*. La Banque de France et le mécanisme des souscriptions publiques: *Durand (Edmond)*.

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Zeitschrift des Königlich Preussischen Statistischen Landesamts. Abteilung 3, 1913—Der Finanzbedarf der preussischen Landkreise im Rechnungsjahre 1908 und die Art seiner Deckung. Im amtlichen Auftrage bearbeitet : *Tetzlaff* (*Dr. Oskar*). Die in Preussen bei der Volkszählung von 1910 ermittelten Religionsbezeichnungen : *Broesike* (*Prof. Dr. M.*). Die Prüfungen für das Lehramt an höheren Schulen in Preussen 1901-02 bis 1911-12. Statistik des Verwaltungsstreitverfahrens in Preussen : *Kuhnert* (*Dr. F.*).

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Zeitschrift für die gesamte Versicherungs-Wissenschaft. January, 1914—Die Verwaltungskosten der Volksversicherung : *Wendt* (*H.*). Der Beharrungszustand und die Beziehungen zwischen Umlage und Kapitaldeckung bei der sozialen Unfallversicherung : *Pietsch* (*Dr. Z.*).

ITALY—

Giornale degli Economisti e Rivista di Statistica—

November, 1913—Sopra la riforma delle pensoni civili e militari *Amoroso* (*Luigi*). L'emigrazione in Siberia e la sua organizzazione : *Griziotti-Kretschmann* (*Jenny*). L'ideale e il vero nelle funzioni delle banche popolari : *Tuccari* (*Luigi*).

December, 1913—A proposito della riforma delle pensioni civili e militari : *Beneduce* (*Alberto*). Intorno alla riforma doganale Nord-Americana : *Caroncini* (*Alberto*). Induzioni statistiche per la teoria della circolazione : *Vecchio* (*Gustavo del*).

La Riforma Sociale. December, 1913—Conseguenze dannose delle assicurazioni sociali in Germania : *Geisser* (*Alberto*). La logica protezionista : *Einaudi* (*Luigi*). Come fu triplicato il corpo elettorale : *Schiari* (*Alessandro*).

MONTHLY LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since December 8, 1913, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Austria—

Labour. Die Kollektiven Arbeits- und Lohnverträge in Österreich. Abschlüsse und Erneuerungen des Jahres 1911. 8vo. 1913. (The Austrian Labour Department.)

—— Kätaster der Anstalten und Einrichtungen für Kinderschutz und Jugendfürsorge in Wien, im übrigen Niederösterreich, Oberosterreich, Salzburg und Steiermark. 8vo. 1913. (The Central Statistical Commission.)

Railways. Wages. Lohnstatistik des Personals der Österreichischen Staatseisenbahnverwaltung nach dem Stande vom 31. Dezember 1912. Band 1. Allgemeiner Teil. Band 2. Staatsbeamte. Staatsdiener, Staatsbahnbedienstete, Ausgenommen Arbeiter. Eisenbahnministerium und Hilfsstellen sowie Direktionen. Band 3. Staatsbahnbedienstete. Ausgenommen Arbeiter. Bediensteten-Kategerien. Band 4. Ständige Arbeiter. 4 vols. La. 8vo. 1913. (The I. and R. Ministry of Railways.)

Cuba—

Industria azucarera y sus derivadas. Zafra de 1911 a 1912. Precios del Azucar y comercio extranjero relecionado con las expresadas industrias en 1910-11 y 1911–12. Fol. 1913. (Secretaria de Hacienda.)

Egypt—

Education. Statistique scolaire de l'Egypte. Année 1912–13. La. 8vo. 1913. (The Government Printing Department, Cairo.)

France—

Labour. Age d'admission au service de la clientèle dans les auberges, hôtels, &c. Rapport de M. Abel Craissac. Procès-verbaux, Enquête et Documents. x + 83 pp., 4to. 1913. (Office du Travail.)

—— Enquête sur la réduction de la durée du travail le samedi. (Semaine anglaise.) xvi + 258 pp., 4to. 1913. (*Id.*)

—— La Réduction de la durée du travail le samedi. (Semaine anglaise.) Rapports, procès-verbaux et documents. xxxvii + 14 pp., 4to. 1913. (*Id.*)

Germany—

Agriculture. Die Deutsche Landwirtschaft. Hauptergebnisse der Reichsstatistik. 279 pp., 8vo. 1913. (Imperial Statistical Bureau.)

Labour. Die Tarifverträge im Deutschen Reiche am Ende des Jahres 1912. Fol. 1913. (Carl Heymanns Verlag.)

Norway—

Assurance. Statistique de l'Institution générale des assurances des bâtiments contre l'incendie pour 1910 à 1912. 8vo. 1913. (The Central Statistical Bureau.)

Census. Recensement industriel 1909 : Salaires. 8vo. 1913. (*Id.*)

Justice. Statistique de la justice criminelle pour 1909 et 1910. 8vo. 1913. (*Id.*)

United States—

Labour. Bulletin of Bureau of Labor Statistics. Whole Numbers 117, 118 133 and 136. 4 parts. 8vo. 1913. (The Department of Labor.)

(a) Foreign Countries—*Contd.*

United States—*Contd.*

Massachusetts. Worcester State Hospital Papers, 1912-13. Offered in compliment to Dr. H. M. Quinby on his retirement from the Superintendency after 20 years' service. Edited by S. T. Orton, M.D. (The Hospital.)

Proceedings of Fifth Conference of Insurance Institute of America, at Hartford, June 10-11, 1913. 8vo. 1913. (The Institute.)

International—

International Federation of Trades Unions. Report of International Secretary of Trades Unions National Centres for 1912-13. Minutes of the 8th International Conference of Representatives of Trades Unions National Centres and Minutes of 1st Conference of International Secretaries, Zurich 16-19 September, 1913. Appendix Resolutions of International Conferences. 66 pp., 8vo. Berlin, 1913. (The Federation.)

(b) India and Colonies.

India—

Census of India, 1911. Vol. v, Bengal, Bihar and Orissa and Sikkim. Part 1, Report. Part 2, Tables. 2 vols., fol. 1913. (The India Office.)

—— Vol. 10, Central Provinces and Berar. Part 1, Report. Fol. 1912. (*Id.*)

Mysore. Brief Summary of Mysore Census, 1911. Fol. 1913. (*Id.*)

Canada, Dominion of—

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Inland Revenues. Reports, returns and statistics of Inland Revenues. Part 1. Excise. Part 2, Inspection of Weights and Measures, &c. Part 3. Adulteration of Food. Years ended March 31, 1908-12. Also Part 1, Excise for 1913. 16 parts, 8vo. 1908-13. (The Department.)

Insurance. Reports of Superintendent of Insurance for years 1908-09 (in 1 vol. each) and for 1910-12 (in 2 vols. each). 8 vols., 8vo. 1909-13. (The Superintendent.)

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Public Works. Reports of Minister of Public Works for Fiscal years ending March 31, 1908, 1909, 1911 (vol. 1), 1912 (vol. 1). 4 vols., 8vo. 1908-13. (The Minister of Public Works.)

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Saskatchewan. Official synopsis of Report of Agricultural Credit Commission 1913. 32 pp., 8vo. Regina, 1913. (The Government Printer.)

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United Kingdom—

Benefices Act, 1898. Return of Transfers of Rights of Patronage, and certain other proceedings under the Act, during 1904 to 1912. (Cd-7139.) 1913. (Purchased.)

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Parliamentary Elections (Expenses). (299.) 1910. (*Id.*)

United States of America. New Customs Tariff Act. Copy of New Act, with comparison of new and former rates of duty. (Cd-7128.) 1913. (*Id.*)

England and Wales—

Board of Agriculture and Fisheries. Report on migration from rural districts in England and Wales. 32 pp., 8vo. 1913. (The Board.)

Census of England and Wales, 1911. Vol. 10. Occupations and Industries. Part 2. Occupations (Condensed List) of Males and Females at Ages in Administrative Counties, County Boroughs, &c. (Cd-7019.) 1913. (The Census Office.)

London County Council. Housing Development and Workmen's Fares. Fol. 1913. (Purchased.)

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Bellom (Maurice)—

Les Fonctionnaires civils et les risques de guerre. Une réforme nécessaire. 24 pp., 8vo. Paris, 1913. (The Author.)

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SHIPPING.—(United Kingdom.)—*Account of Tonnage of Vessels Entered and Cleared with Cargoes, from and to Various Countries, during the* Years *ended Dec.*, 1913-12-11.

Countries from whence Entered and to which Cleared.	Total British and Foreign.					
	1913.		1912.		1911.	
	Entered.	Cleared.	Entered.	Cleared.	Entered.	Cleared.
FOREIGN COUNTRIES.	Tons	Tons.	Tons.	Tons.	Tons.	Tons.
Russia Northern ports	3,315,213	3,296,217	2,901,672	2,535,743	2,911,457	2,337,498
Southern ,,	566,534	327,945	531,732	119,349	947,891	141,259
Pacific ,,	61,921	36,752	97,630	28,958	122,865	24,395
Sweden	1,689,310	2,697,701	1,590,092	2,497,314	1,564,690	2,387,374
Norway	1,371,121	1,634,775	1,326,778	1,625,242	1,352,622	1,509,750
Denmark	547,586	2,047,124	530,884	1,930,763	508,872	1,984,125
Germany	2,537,581	5,810,076	2,252,511	5,477,785	2,337,188	5,692 819
Netherlands	3,164,717	3,503,373	3,081,531	3,438,631	3 045,058	3,335,781
Belgium	3,088,602	3,029,464	2,975,143	2,856,497	2,256,381	2,849,815
France	4,056,554	8,627,450	3,566,495	7,166,846	2,689,154	6,531,370
Spain	3,131,540	2,220,784	2,951,441	2,101,306	2,729,122	1,965,990
Portugal	296,763	778,013	263,408	737,272	268,974	662,042
Italy	398,334	4,838,100	411,671	4,610,361	387,180	4,763,503
Austria-Hungary	128,758	619,794	91,629	495,064	82,660	601,009
Greece	118,750	361,196	123,194	300,123	182,640	336,456
Turkey	179,710	285,998	275,762	272,007	253,472	412,108
Roumania	162,247	207,723	236,153	188,175	525,704	216,375
Egypt	310,953	1,723,311	452,798	1,662,012	351,688	1,707,669
Algeria	465,358	687,341	454,275	593,456	436,338	587,391
Portuguese East Africa	293,504	398,230	236,347	415,952	244,743	407,595
United States of America	8,663,347	6,837,703	7,991,954	6,578,459	6,411,039	5,095,528
Mexico, Foreign W. Indies, and Central America	548,155	612,964	400,101	589,759	293,235	519,732
Colombia	142,379	42,855	126,898	43,823	114,927	35,332
Brazil	259,894	1,422,773	249,275	1,339,124	248,084	1,324,246
Peru	228,662	274,729	215,451	250,831	259,749	241,149
Chile	158,278	488,090	128,162	457,446	126,412	575,617
Uruguay	64,911	458,578	101,235	481,151	43,288	496,573
Argentine Republic	2,590,918	3,713,570	2,232,590	3,029,886	1,462,239	2 554,522
China	64,190	154,389	91,096	89,764	59,681	65,228
Java	88,620	316,751	169 086	201,675	114,821	285,517
Japan	508,174	752,735	509,435	770,057	517,277	704,923
Other countries	905,119	850,779	993,716	752,789	700,365	665,207
Total, Foreign Countries.	40,110,733	59,087,286	37,563,025	53,767,920	33,549,816	51,050,898
BRITISH POSSESSIONS.						
British North America	3,090,915	2 489,766	2,860,592	2,113,557	2,809,942	2,375,826
British India	2,235,385	1,811,874	2 370,120	1,681,521	2,067,004	1,648,428
Mauritius, Ceylon, Straits Settlements, & Hong Kong	122,518	383,551	104,563	309,428	93,837	322,745
Australia	1,358,829	1,174,471	1,295,108	1,140,152	1,386,698	1,092,988
New Zealand	410,895	486,526	456,984	497,110	361,999	502,120
West Indies	186,660	109,956	185,766	128,085	159,119	224 417
Channel Islands	494,063	355,056	462,648	353,625	477,526	359,732
Gibraltar and Malta	92,130	498,132	139,504	423,259	60,757	360 625
Union of South Africa	119,076	759,101	406,707	712,844	512,111	725,485
Other possessions	541,780	661,694	503,068	579,028	467,652	600,050
Total, British Possessions	8,952,251	8,733,127	8,785,057	8,268,609	8,396,645	8,212,416
TOTAL FOREIGN COUNTRIES AND BRITISH POSSESSIONS.						
Twelve Months ended December, 1913	49,062,984	67,820,413	—	—	—	—
'12	—	—	46,348,082	62,036,529	—	—
'11	—	—	—	—	41,946,461	59,263,314

Values of Imports *into the United Kingdom for the Years* 1911-12-13.*

[From the Monthly Trade Returns, December, 1913.]

	Year ended December 31,			Increase (+) or Decrease(−) in 1913 as Compared with 1912.	Increase (+) or Decrease(−) in 1913 as Compared with 1911.
	1911.	1912.	1913.		
I. Food, Drink, and Tobacco—	£	£	£	£	£
A. Grain and flour	75,760,943	88,496,284	85,527,938	− 2,968,346	+ 9,766,995
B. Meat, including animals for food	49,722,183	49,079,559	56,743,914	+ 7,664,355	+ 7,021,731
C. Other food and drink—					
(1.) Non-dutiable	73,638,263	77,319,259	81,265,948	+ 3,946,689	+ 7,627,685
(2.) Dutiable	59,551,830	59,333,614	58,791,211	− 542,403	− 760,619
D. Tobacco	5,284,918	6,359,115	8,068,293	+ 1,709,178	+ 2,783,375
Total, Class I	263,958,137	280,587,831	290,397,304	+ 9,809,473	+ 26,439,167
II. Raw Materials and Articles Mainly Unmanufactured—					
A. Coal, coke, and manufactured fuel	29,779	276,516	36,700	− 239,816	+ 6,921
B. Iron ore, scrap iron, and steel	5,799,162	6,219,050	7,432,760	+ 1,213,710	+ 1,633,598
C. Other metallic ores	8,859,967	9,059,505	10,197,475	+ 1,137,970	+ 1,337,508
D. Wood and timber	25,862,171	28,357,158	33,789,356	+ 5,432,198	+ 7,927,185
E. Cotton	71,155,514	80,238,960	70,570,511	− 9,668,449	− 585,003
F. Wool	36,037,451	36,567,818	37,787,338	+ 1,219,520	+ 1,749,887
G. Other textile materials	14,611,045	18,578,100	19,751,121	+ 1,173,021	+ 5,140,076
H. Oil seeds, nuts, oils, fats, and gums	35,047,549	37,418,767	41,636,408	+ 4,217,641	+ 6,588,859
I. Hides and undressed skins	11,106,664	13,690,265	15,067,595	+ 1,377,330	+ 3,960,931
J. Paper-making materials	4,749,521	5,566,996	5,815,576	+ 248,580	+ 1,066,055
K. Miscellaneous	34,900,038	39,694,431	39,839,049	+ 144,618	+ 4,939,011
Total, Class II.	248,158,861	275,667,566	281,923,839	+ 6,256,323	+ 33,765,028
III. Articles Wholly or Mainly Manufactured—					
A. Iron and steel and manufactures thereof	11,133,854	12,961,991	15,230,694	+ 2,268,703	+ 4,096,840
B. Other metals and manufactures thereof	27,581,244	31,197,428	32,102,246	+ 904,818	+ 4,521,002
C. Cutlery, hardware, implements (except machine tools), and instruments	5,273,043	6,991,329	7,376,947	+ 385,618	+ 2,103,904
D. Electrical goods and apparatus (other than machinery and uninsulated wire)	1,435,492	1,457,643	1,587,318	+ 129,675	+ 151,826
E. Machinery	5,768,662	6,820,683	7,282,046	+ 461,363	+ 1,513,384
F. Ships (new)	64,484	33,654	34,164	+ 510	− 30,320
G. Manufactures of wood and timber (including furniture)	2,551,897	2,873,828	3,583,410	+ 709,582	+ 1,031,513
H. Yarns and textile fabrics—					
(1.) Cotton	11,279,717	11,541,622	12,248,890	+ 737,268	+ 969,173
(2.) Wool	9,586,856	10,112,331	10,490,446	+ 378,115	+ 903,590
(3.) Silk	13,441,249	14,356,280	15,115,581	+ 759,301	+ 1,674,332
(4.) Other materials	7,894,776	8,890,211	9,129,183	+ 238,972	+ 1,234,407
I. Apparel	5,199,932	6,041,393	5,980,673	− 60,720	+ 780,741
J. Chemicals, drugs, dyes, and colours	11,411,060	12,545,758	12,906,509	+ 360,751	+ 1,495,449
K. Leather and manufactures thereof (including gloves, but excluding boots and shoes)	12,227,521	14,342,926	13,430,783	− 912,143	+ 1,203,262
L. Earthenware and glass	4,049,083	4,279,280	4,546,254	+ 266,974	+ 497,171
M. Paper	6,574,550	7,234,437	7,674,539	+ 440,102	+ 1,099,989
N. Railway carriages and trucks (not of iron), motor cars, cycles, carts, &c.	6,500,046	7,851,343	8,359,434	+ 508,091	+ 1,859,388
O. Miscellaneous	23,583,645	25,964,697	26,526,255	+ 562,258	+ 2,943,310
Total, Class III	165,557,111	185,466,834	193,606,072	+ 8,139,238	+ 28,048,961
IV. Miscellaneous and Unclassified (including parcel post)	2,483,418	2,918,400	3,106,694	+ 188,294	+ 623,276
Total	680,157,527	744,640,631	769,033,959	+ 24,393,328	+ 88,876,432

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* The values of the imports represent the cost, insurance, and freight; or, when goods are consigned for sale, the latest sale value of such goods.

Values of **Exports** *of British and Irish Produce and Manufactures for the Years* **1911-12-13.*** [From the Monthly Trade Returns, December, 1913.]

	Year ended December 31,			Increase (+) or Decrease (−) in 1913 as Compared with 1912.	Increase (+) or Decrease (−) in 1913 as Compared with 1911.
	1911.	1912.	1913.		
I. FOOD, DRINK, AND TOBACCO—	£	£	£	£	£
A. Grain and flour	3,573,905	4,238,880	3,564,983	− 673,897	− 8,922
B. Meat, including animals for food	1,023,361	1,102,582	1,239,000	+ 136,418	+ 215,639
C. Other food and drink	22,268,918	24,725,379	24,427,424	− 297,955	+ 2,158,506
D. Tobacco	2,171,394	2,618,967	3,376,353	+ 757,386	+ 1,204,959
Total, Class I.	29,037,578	32,685,808	32,607,760	− 78,048	+ 3,570,182
II. RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED—					
A. Coal, coke, and manufactured fuel	38,447,354	42,584,454	53,658,636	+ 11,074,182	+ 15,211,282
B. Iron ore, scrap iron, and steel	452,614	409,335	411,768	+ 2,433	− 40,846
C. Other metallic ores	110,965	115,068	130,487	+ 15,419	+ 19,522
D. Wood and timber	199,068	323,958	340,339	+ 16,381	+ 141,271
E. Cotton	...	...	...	...	...
F. Wool	3,901,752	4,817,642	4,605,434	− 212,208	+ 703,682
G. Other textile materials	435,699	475,058	435,156	− 39,902	− 543
H. Oil seeds, nuts, oils, fats, and gums	4,793,768	4,568,504	4,471,448	− 97,056	− 322,320
I. Hides and undressed skins	1,685,293	2,027,826	1,889,394	− 138,432	+ 204,101
J. Paper making materials	818,580	927,668	959,645	+ 31,977	+ 141,065
K. Miscellaneous	2,880,437	3,167,940	2,994,121	− 173,819	+ 113,684
Total, Class II.	53,725,530	59,417,453	69,896,428	+ 10,478.975	+ 16,170,898
III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—					
A. Iron and steel and manufactures thereof	43,730,292	48,597,677	54,328,292	+ 5,730,615	+ 10,598,000
B. Other metals and manufactures thereof	11,022,536	12,284,471	13,288,350	+ 1,003,879	+ 2,265,814
C. Cutlery, hardware, implements (except machine tools), and instruments	7,395,084	8,108,878	7,974,457	− 134,421	+ 579,373
D. Electrical goods and apparatus (other than machinery and uninsulated wire)	2,819,374	4,341,587	5,404,671	+ 1,063.084	+ 2,585,297
E. Machinery	30,960,678	33,158,015	37,027,582	+ 3,869,567	+ 6,066,904
F. Ships (new)	5,663,115	7,027,162	11,031,236	+ 4,004,074	+ 5,368,121
G. Manufactures of wood and timber (including furniture)	2,037,272	2,058,818	2,037,726	− 21,092	+ 454
H. Yarns and textile fabrics—					
(1.) Cotton	120,063,355	122,219,939	127.206,820	+ 4,986,881	+ 7,143,465
(2.) Wool	37,239,197	37,773,504	37,686,781	− 86,723	+ 447,584
(3.) Silks	2,381,528	2,225,739	2,157,013	− 68,726	− 224,515
(4.) Other materials	13,198,754	14,576,309	14,826,432	+ 250,123	+ 1,627,678
I. Apparel	13,820,465	15,722,778	16.426,112	+ 703,334	+ 2,605,647
J. Chemicals, drugs, dyes, and colours	20,053,129	21,036,390	22,012,238	+ 975,848	+ 1,959,109
K. Leather and manufactures thereof (including gloves, but excluding boots and shoes)	4,879,175	5,248,345	5,657,325	+ 408,980	+ 778,150
L. Earthenware and glass	4,713,298	4,973,374	5,214,186	+ 240,812	+ 500,888
M. Paper	3,310,966	3,559,317	3,678,680	+ 119,363	+ 367,714
N. Railway carriages and trucks (not of iron), motor cars, cycles, carts, &c.	8,125,047	9,758,210	11,373,566	+ 1,615,356	+ 3,248,519
O. Miscellaneous	30,809,362	32,357,802	34,240,678	+ 1,882,876	+ 3,431,316
Total, Class III.	362,222,627	385,028,315	411.572,145	+ 26,543,830	+ 49,349,518
IV. MISCELLANEOUS AND UNCLASSIFIED (including parcel post)	9,133,563	10,091,863	11,385,083	+ 1,293,220	+ 2,251,520
Total	454,119,298	487,223,439	525.461,416	+ 38,237,977	+ 71,342,118

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* The values of the exports represent the cost and the charges of delivering the goods on board the ship, and are known as the "free on board" values.

REVENUE OF THE UNITED KINGDOM.

Net Produce in Quarters in 1913, *and in Financial Years ended March* 31, 1912-13, 1911-12, 1910-11, 1909-10.

[000's omitted.]

QUARTERS, ended	March 31, 1913.	June 30, 1913.	September 30, 1913.	December 31, 1913.	Total for Calendar Year 1913.
	£	£	£	£	£
Customs	8,458,	8,320,	8,556,	9,327,	34,661,
Excise	9,653,	8,321,	8,859,	12,067,	38,900,
Stamps and estate, &c., duties	8,132,	9,417,	9,994,	8,728,	36,271,
Taxes (Land Tax and House Duty)	2,240,	300,	—	100,	2,640,
Post Office	6,210.	3,900,	5,100,	5,720,	20,930,
Telephone Service	1,575,	1,510,	1,635,	1,500,	6,220,
Telegraph Service	740,	780,	815,	750,	3,085,
	37,008,	32,548,	34,959,	38,192,	142,707,
Property and Income Tax	32,614,	5,982,	3,079,	3,000,	44,675,
	69,622,	38,530,	38,038,	41,192,	187,382,
Crown Lands	160,	110,	100,	160,	530,
Interest on Advances	576,	6,	778.	216,	1,576,
Miscellaneous	761,	713,	454,	679,	2,610,
Land value duties	362,	122,	62,	112,	658,
Totals	71,484,	39,481,	39,432,	42,359,	192,756,

YEARS, ended March 31,	1912-13.	1911-12.	1912-13.		Corresponding Years.	
			Less.	More.	1910-11.	1909-10.
	£	£	£	£	£	£
Customs	33,185,	33,649,	164,	—	33,140,	30,348,
Excise	38,000,	38,389,	380,	—	40,020,	31.032,
Stamps and estate, &c., duties	35,307,	34,846,	—	461,	35,236,	29,845,
Taxes (Land Tax and House Duty)	2,700,	2,880,	180,	—	4,300,	710,
Post Office	20,300,	19,650,	—	650,	19,220,	18,220,
Telephone Service	5,775,	2,945,	—	2,830,	1.955,	1,720,
Telegraph Service	3,100,	3,105,	5,	—	3,175,	3,090,
	138,667,	135,455,	729,	3,941,	137,046,	114,965,
Property and Income Tax	41,806,	44,804,	—	2,	61,946,	13.295,
	183,473,	180,259,	729,	3,943,	198,992,	128,260,
Crown Lands	530,	530,	—	—	500,	480,
Interest on Advances	1,419,	1,281,	—	138,	1,234,	1,296,
Miscellaneous	2,925,	2,539,	—	386,	2,604,	1,687,
Totals	188,347,*	184,609,*	729,	4,467,	203,330,*	131,696,*
			NET INC. £3,738.			

* Excluding Land Value Duties.

BANK OF ENGLAND.

Pursuant to the Act 7th and 8th Victoria, cap. 32 (1844),

[0,000's omitted.]

1	2	3	4	5	6	7
Issue Department.					Collateral Columns.	
Liabilities.		Assets.				
Notes Issued.	Dates. (Wednesdays.)	Government Debt.	Other Securities.	Gold Coin and Bullion.	Notes in Hands of Public. (Col. 1 minus col. 16.)	Minimum Rates of Discount at Bank of England.
£ Mlns.	1913.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	Per cent.
48,83	Jan. 1	11,02	7,43	30,38	29.22	5
50,88	,, 8	11,02	7,43	32,43	28,03	
52,71	,, 15	11,02	7,43	34,26	28,08	
53,37	,, 22	11,02	7,43	34,92	27,66	
53,96	,, 29	11,02	7,43	35,51	27,78	
53,71	Feb. 5	11,02	7,43	35,26	28,07	
54,44	,, 12	11,02	7,43	35,99	27,68	
55,10	,, 19	11,02	7,43	36,65	27,79	
55,09	,, 26	11,02	7,43	36,64	27,71	
54,89	Mar. 5	11,02	7,43	36,44	28.12	
54,95	,, 12	11,02	7,43	36,50	27.95	
54,10	,, 19	11,02	7,43	35,65	28.48	
53,74	,, 26	11,02	7,43	35,29	28.25	
53,58	April 2	11,02	7,43	35,13	29.23	
54,20	,, 9	11,02	7,43	35,75	28,74	
54,94	,, 16	11,02	7,43	36,49	28.44	4½
55,23	,, 23	11,02	7,43	36,78	28.43	
54,75	,, 30	11,02	7,43	36,30	28,04	
53,83	May 7	11,02	7,43	35,38	28.00	
53,40	,, 14	11,02	7,43	34,95	28.65	
54,70	,, 21	11,02	7,43	36,25	28,38	
54,74	,, 28	11,02	7,43	36,29	28,77	
54,54	June 4	11,02	7,43	36,09	28,64	
54,73	,, 11	11,02	7,43	36,28	27,39	
55,39	,, 18	11,02	7,43	36,94	28,23	
55,22	,, 25	11,02	7,43	36,77	28,65	
53,90	July 2	11,02	7,43	35,45	29,63	
54,29	,, 9	11,02	7,43	35,84	29,62	
55,11	,, 16	11,02	7,43	36,66	29.39	
55,62	,, 23	11,02	7,43	37,17	29.46	
56,19	,, 30	11,02	7,43	37,74	29,86	
55,97	Aug. 6	11,02	7,43	37,52	29.06	
57,95	,, 13	11,02	7,43	39,50	29.57	
59,19	,, 20	11,02	7,43	40,74	29.34	
60,01	,, 27	11,02	7,43	41,56	29.25	
60,14	Sept. 3	11,02	7,43	41,69	29.46	
59,33	,, 10	11,02	7,43	40,88	29.05	
58,85	,, 17	11,02	7,43	40,40	28.73	
57,56	,, 24	11,02	7,43	39,11	28.66	
54,49	Oct. 1	11,02	7,43	36,04	29.64	5
52,63	,, 8	11,02	7,43	34,18	29.23	
52,84	,, 15	11,02	7,43	34,39	28.85	
53,59	,, 22	11,02	7,43	35,14	28.67	
54,21	,, 29	11,02	7,43	35,76	28.73	
53,60	Nov. 5	11,02	7,43	35,15	28.74	
53,57	,, 12	11,02	7,43	35,12	[illegible]	
53,74	,, 19	11,02	7,43	35,29	[illegible]	
54,35	,, 26	11,02	7,43	35,90	28.42	
53,65	Dec. 3	11,02	7,43	35,20	28.79	
53,69	,, 10	11,02	7,43	35,24	28.58	
52,69	,, 17	11,02	7,43	34,24	28,80	
50,50	,, 24	11,02	7,43	32,05	29.36	

—Weekly Return.

for Wednesday in each Week, during the Year **1913.**

[0,000's omitted.]

8	9	10	11	12	13	14	15	16	17	18
Banking Department.										
Liabilities.					Dates. (Wednesdays.)	Assets.				Totals of Liabilities and Assets.
Capital and Rest.		Deposits.		Seven Day and other Bills.		Securities.		Reserve.		
Capital.	Rest.	Public.	Private.			Government.	Other.	Notes.	Gold and Silver Coin.	
£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	1913.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.
14,55	3,32	14,16	52,95	,3	Jan. 1	14,84	49,63	19,63	,92	85,02
14,55	3,44	9,81	41,79	,2	„ 8	13,69	32,69	22,25	,98	69,61
14,55	3,48	10,69	41,48	,5	„ 15	13,04	31,58	24,63	1,01	70,26
14,55	3,50	13,93	39,33	,3	„ 22	13,04	31,75	25,71	,85	71,35
14,55	3,51	16,48	40,59	,2	„ 29	13,04	35,04	26,18	,89	75,15
14,55	3,52	18,27	38,24	,2	Feb. 5	13,04	34,99	25,65	,93	74,60
14,55	3,54	20,90	39,68	,2	„ 12	13,04	37,90	26,76	1,00	78,69
14,55	3,56	23,54	37,68	,3	„ 19	13,04	37,96	27,31	1,06	79,37
14,55	3,56	23,55	41,67	,3	„ 26	13,03	41,87	27,39	1,07	83,36
14,55	3,68	24,64	40,49	,2	Mar. 5	13,03	42,53	26,78	1,04	83,38
14,55	3,72	26,77	40,53	,3	„ 12	13,03	44,64	27,00	,92	85,59
14,55	3,82	25,63	40,66	,3	„ 19	13,03	44,82	25,62	1,21	84,69
14,55	3,83	26,11	41,29	,2	„ 26	13,03	46,03	25,49	1,25	85,81
14,55	3,82	21,09	40,37	,2	April 2	13,03	41,09	24,56	1,17	79,85
14,55	3,22	16,08	43,44	,2	„ 9	13,03	37,47	25,46	1,35	77,31
14,55	3,24	15,81	42,44	,2	„ 16	13,03	35,10	26,50	1,43	76,06
14,55	3,24	15,67	41,18	,2	„ 23	12,88	33,56	26,80	1,42	74,66
14,55	3,22	15,73	39,57	,2	„ 30	12,88	32,99	25,77	1,47	73,10
14,55	3,25	14,19	38,76	,2	May 7	12,88	31,46	24,93	1,50	70,77
14,55	3,26	13,66	38,49	,1	„ ·14	12,88	30,88	24,80	1,41	69,97
14,55	3,23	13,95	40,72	,1	„ 21	12,80	31,88	26,32	1,46	72,46
14,55	3,23	13,86	39,71	,2	„ 28	12,80	30,69	26,47	1,43	71,39
14,55	3,21	13,68	38,74	,2	June 4	12,80	29,99	25,91	1,51	70,20
14,55	3,23	13,82	40,14	,2	„ 11	12,80	31,04	26,34	1,57	71,76
14,55	3,23	15,08	40,96	,2	„ 18	12,76	32,38	27,16	1,55	73,85
14,55	3,25	18,03	41,30	,3	„ 25	12,76	36,19	26,57	1,65	77,16
14,55	3,35	14,74	46,63	,2	July 2	12,76	40,66	24,27	1,60	79,29
14,55	3,45	10,73	41,07	,2	„ 9	12,76	30,85	24,67	1,55	69,83
14,55	3,47	10,40	40,71	,4	„ 16	12,76	29,12	25,72	1,57	69,17
14,55	3,48	11,54	40,05	,3	„ 23	12,76	29,18	26,16	1,56	69,66
14,55	3,50	10,94	40,82	,2	„ 30	12,76	29,19	26,34	1,54	69,82
14,55	3,51	9,35	39,82	,1	Aug. 6	12,76	26,99	26,01	1,49	67,25
14,55	3,52	9,34	42,21	,1	„ 13	12,46	27,24	28,38	1,57	69,64
14,55	3,54	10,34	43,21	,2	„ 20	12,45	27,81	29,85	1,56	71,67
14,55	3,51	9,99	44,42	,2	„ 27	12,45	27,67	30,76	1,60	72,49
14,55	3,67	9,52	44,57	,1	Sept. 3	12,45	27,63	30,68	1,56	72,32
14,55	3,68	9,01	43,55	,2	„ 10	12,45	26,52	30,28	1,56	70,81
14,55	3,69	9,63	42,63	,2	„ 17	12,45	26,31	30,15	1,61	70,52
14,55	3,76	10,24	41,97	,3	„ 24	12,45	27,61	28,90	1,57	70,54
14,55	3,75	9,74	39,83	,2	Oct. 1	13,29	24,85	24,85	1,56	67,90
14,55	3,16	5,99	41,21	,2	„ 8	14,49	25,52	23,40	1,53	64,94
14,55	3,16	5,34	41,76	,3	„ 15	14,49	24,77	24,00	1,59	64,85
14,55	3,17	5,95	41,32	,2	„ 22	13,49	24,93	24,91	1,69	65,02
14,55	3,18	8,71	41,06	,2	„ 29	11,79	28,62	25,48	1,63	67,52
14,55	3,19	7,13	42,40	,3	Nov. 5	11,79	29,03	24,86	1,62	67,31
14,55	3,19	9,63	38,40	,2	„ 12	11,79	27,36	25,07	1,58	65,80
14,55	3,21	10,61	38,25	,2	„ 19	11,78	27,99	25,34	1,53	66,64
14,55	3,19	9,75	40,72	,2	„ 26	11,18	29,59	25,93	1,52	68,23
14,55	3,20	7,76	39,89	,1	Dec. 3	11,18	27,94	24,86	1,42	65,41
14,55	3,21	7,89	39,51	,2	„ 10	11,18	27,51	25,11	1,38	65,19
14,55	3,22	8,03	37,46	,2	„ 17	11,19	27,02	23,90	1,18	63,29
14,55	3,25	9,42	42,07	,2	„ 24	11,20	35,93	21,13	1,05	69,32

GOLD AND SILVER BULLION AND SPECIE.—(United Kingdom.) —*Declared Real Value of*, IMPORTED AND EXPORTED, *for the* **Years 1913-12-11.**

[000's omitted.]

Countries.	1913.		1912.		1911.	
	Gold.	*Silver.*	Gold.	*Silver.*	Gold.	*Silver.*
Imported from—	£	£	£	£	£	£
Australasia	536,	201,	975,	58,	1,535,	48,
S. America, Brazil, Mexico, W. Indies	8,704,	261,	1,376,	430,	2,327,	341,
United States	64,	10,714,	17,	13,361,	66,	11,898,
	9,304,	11,176,	2,368,	13,849,	3,928,	12,287,
France	979,	189,	118,	221,	1,830,	177,
Germany, Holland, and Belgium	850,	364,	544,	785,	240,	349,
Portugal, Spain, and Gibraltar	150,	19,	123,	28,	103,	14,
Malta and Egypt	1,834,	35,	78,	38,	747,	32,
China, with Hong Kong and Japan	—	129,	—	482,	—	30,
West Coast of Africa	1,620,	174,	1,520,	29,	943,	153,
British Possessions in South Africa	40,795,	4,	41,213,	7,	37,217,	3,
British East Indies	161,	5,	172,	6,	139,	27,
All other Countries	3,841,	2,400,	6,553,	1,333,	3,547,	1,222,
Totals Imported	59,534,	14,495,	52,689,	16,778,	48,694,	14,294,
Exported to—						
France	6,268,	572,	1,661,	362,	6,571,	942,
Germany, Holland, Belg., and Sweden	10,523,	2,516,	8,526,	994,	7,047,	1,791,
Russia	2,081,	720,	480,	976,	481,	1,733,
Portugal, Spain, and Gibraltar	138,	71,	170,	164,	165,	130,
Malta and Egypt	7,815,	48,	8,391,	102,	4,195,	247,
	26,825,	3,927,	19,228,	2,598,	18,459,	4,843,
B. India, China, Hong Kong, and Japan	10,828,	10,672,	13,100,	14,300,	9,165,	9,831,
United States	713,	3,	2,051,	24,	14,	9,
South Africa	77,	1,	73,	86,	837,	160,
S. America, Mexico, W. Indies	4,956,	119,	6,438,	475,	6,431,	441,
All other Countries	2,688,	1,333,	5,648,	850,	5,694,	1,639,
Totals Exported	46,087,	16,055,	46,538,	18,333,	40,100,	16,923,
Excess of imports	13,447,	—	6,151,	—	8,594,	—
,, exports	—	1,560,	—	1,555,	—	2,630,

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The FERTILITY *of* MARRIAGE *in* SCOTLAND: *a* CENSUS STUDY. BY JAMES CRAUFURD DUNLOP, M.D., F.R.C.P. Edin., *Superintendent of the Statistical Department of the Office of the Registrar-General for Scotland.*

[Read before the Royal Statistical Society, January 20, 1914, the President, Professor F. Y. EDGEWORTH, M.A., F.B.A., in the Chair.]

I THINK I am right in asserting that it was principally on the initiative of this Society that questions relative to the fertility of marriage were inserted in the householders' schedules of the recent census, and the fertility of marriage thereby made a subject of censal study. Under these circumstances I feel that I am not called on to make any preliminary remarks either in defence of the interest or importance of the subject, or in defence of my asking you to give me a hearing.

I shall endeavour firstly to explain the methods of tabulation employed for the purposes of this study in Scotland, and secondly to indicate some of the more interesting results. I feel that it is unnecessary in this paper to reproduce the lengthy tables which were prepared for the Third Volume of Report on the Twelfth Census of Scotland (Cd–7163), as that volume is now published, and the tables are available to all interested. The tables I include in this paper—Tables XIV to XVIII excepted—are merely short abstracts of those appearing in the Census Report.

The tabulation of facts regarding the fertility of marriage.

The tabulation of the censal information regarding the fertility of marriage has been no simple task, but a complex one, and was so partly on account of the number of variables concerned and partly on account of the wide limits through which each varies. The primary tabulation was concerned with four of these, three being independent, and one dependent. They are :—

(1) The number of children in the families. This is the dependent variable, and facts regarding it were directly obtained from the householders' schedules, the figures being those given in answer to the question regarding the number of children born, no matter whether alive at the census date or not. The reported sizes of families extended up to 20 children, and in a few exceptional cases beyond that figure. The largest families reported were 3 of 21 children, 4 of 22 children, 1 of 23 children, and 1 of 25 children. In some instances, not many, the information regarding the number of children in the householders' schedules was palpably incorrect and indicative of confusion, and when this was so the marriages were excluded from the tabulation. These were mostly cases where recently married women or women married late in life, were reported to have had families of considerable size, there having been included in the family of the existing marriage either children of a previous marriage or children born before marriage.

(2) The age of the wife at marriage. This variable was not directly reported on the schedules but was ascertainable by deducting the years of duration of marriage from the age at census date of the wife. This being a study of the fertility of marriage it was useless to include in it any marriage in which the women were past child-bearing age at the time of marriage, and consequently all marriages in which the wives were aged 45 or over at that time were excluded. This limit is no doubt arbitrary, and may not be in absolute harmony with physiological fact, but is defensible as being a good working limit, for childbirth after that age is so far exceptional that the inclusion of such marriages would mask rather than show normality.

(3) The age of the husband at marriage. This age, like that of the wife, was not directly reported, but was ascertainable by a comparison between the age at the time of the census and the durations of the marriage. A certain number of marriages had to be excluded from the study by reason of the absence of this information, as was the case when the husband was not enumerated on the same schedule as the wife on account of temporary, or permanent, absence from home on census day.

(4) The duration of marriage. Facts regarding this variable were directly reported on the schedules.

The total number of married women enumerated in Scotland was 762,835, and the total number of marriages dealt with in this study was 686,684, 76,151 being the total number excluded for one or other of the before-mentioned reasons. The included marriages amount to fully 90 per cent. of the maximum possible, and may be accepted as being thoroughly representative of what exists in the country.

The Hollerith system of card sorting and card counting was used for the tabulation. The reported facts regarding each of the 686,684 marriages were by suitable perforations recorded on specially prepared cards, and these cards were mechanically sorted into groups and afterwards counted, the numbers being recorded in a tabular manner.

In the principal tabulation, that dealing with the correlations between the three independent variables and the one dependent variable, the cards were first sorted by the years of duration of marriage into groups. These groups were afterwards subdivided first by the age of the wife at marriage, and afterwards by that of the husband. In this manner groups homogeneous so far as the independent variables are concerned were obtained, and these groups were counted by the number of children in the families. This tabulation was very lengthy and complex, and this was so on account of the large number of combinations of the variables, these combinations amounting approximately to 25,000. So lengthy was this tabulation that its publication in full in the Census Report was not practicable, and recourse to publication by abstract was necessitated. (Sample sheets of the original tabulation exhibited.) Although this original tabulation is not published it is not lost for purposes of study and research, for the sheets will be preserved in the Office of the Registrar-General of Scotland, and will be available for study or abstraction to any interested.

The contingency tables of this first tabulation gave for each combination of duration and age of wife the number of children in the families in correlation to the age of the husband. Having this, the next step was to transcribe the entire tabulation, collecting on the sheets facts regarding the families of each combination of duration and age of husband, and showing the correlation between the age of wife and number of children. This second series of tables (sample exhibited) was also too long for publication.

From these two sets of tables those published in the Third Volume of the Census Report were abstracted, the principle of abstraction being the elimination of first one variable, then another, and lastly a third. For instance, in Table XXXIII of the Report, figures are given which show for each year's duration of marriage the numbers of families of specified sizes resulting from the marriages of women of specified ages without taking any cognizance of the ages of the husbands, and Table XXXIV gives similar information for marriages of specified ages of husband without cognizance of the ages of wives. In Table XXXII the size of family is the variable eliminated, it being replaced by a mere statement of the average size of family resulting from the marriages of persons of specified ages after specified durations. By a continuation of this process of elimination short general summary tables, which include all the marriages of the study, were produced.

For special purposes further tabulations were made and will be referred to later in this Paper, but it is here convenient to refer to one of them. This consisted in the division of all the reported marriages into two classes, the one including all marriages in which the wife had on census day attained age 45 and in which the fertile period was complete, and the other including all marriages in which the wives had not attained that age and in which the fertility was a continuing quantity. The statistical facts regarding each of these classes were separately abstracted. In the case of marriages of completed fertility the tabulation was comparatively simple for it was concerned with two independent variables only, the ages of the wives and husbands at the time of marriage, but the tabulation for the marriages of continuing fertility was more complex for the third independent variable, the duration of the marriage, was additional. Tables XXXV to XLV of the third volume of the Census Report deal with the statistics of these two classes.

Before passing on to describe the influence of the independent variables, the ages of the parents and the duration of the marriages, on the number of children born, it is convenient to briefly refer to two statistical methods used in studying the figures of the above-quoted groups of marriages for the purpose of ascertaining the influence of each varying factor, and for the purpose of constructing fertility tables capable of predicting the probable fertility of marriage in the same manner as life tables predict the probable duration of life. The first method used for this purpose was that of multiple correlation, the actual working being carried out as described in Mr. Udny Yule's book entitled *An Introduction to the Theory of Statistics*. The resulting coefficients, regressions and formulæ are published in Appendix I of the third volume of the Census Report. This method, however, was found not to be entirely satisfactory for the purpose on account of some non-linearity of regressions, and though the figures obtained no doubt give a fair approximation, they were found to be not sufficiently accurate for the purposes of the construction of fertility tables. A method of calculating multiple correlations from non-linear regression was required, and this being a matter of great difficulty, was not attempted in the Census Office, but was referred to Mr. George Rae, B.Sc., Assistant to the Professor of Mathematics in Aberdeen University, and the problem was worked out by him. He devised the necessary method and applied it to the two classes of marriages referred to above, those of continuing and of completed fertility. I shall refer presently to his results, but I shall make no attempt either to demonstrate or to prove his method, for he has done these for himself in a memorandum which is appended (Appendix II) to the Census Report. Tables XXXVIII and XLV of that report consist of predicted fertility figures prepared by him, Table XXXVIII dealing with completed, and Table XLV with continuing fertilities.

Results of the study.

Size of family.—This is best studied from the tabulation of the group of marriages of completed fertility. The number of marriages included in this group is 239,943, and as the children born to them number 1,316,995, the average family amounts to 5·49 children.

The following table (Table I) shows the number of families of specified sizes found in this group of marriages, and the percentage these families form of the total. In it there may be seen that of the 239,943 marriages of completed fertility, 27,478, or 11·5 per cent., were sterile, while children were born to 212,465, or 88·5 per cent. Marriages to which only one child was born constituted 5·9 per cent. of the total, which proportion was 7·0 per cent. in the case of

TABLE I.—*Number of children to marriages in which the fertile period is complete.*

Number of children in family.	Number of families.	Per cent. of total.	Number of children in family.	Number of families.	Per cent. of total
0	27,478	11·5	14	1,667	0·7
1	14,100	5·9	15	657	0·3
2	16,910	7·0	16	293	0·1
3	19,648	8·2	17	132	0·1
4	21,759	9·1	18	53	0·0
5	22,189	9·2	19	19	0·0
6	22,529	9·4	20	6	0·0
7	21,316	8·9	21	3	0·0
8	20,229	8·4	22	4	0·0
9	17,529	7·3	23	1	0·0
10	14,129	5·9	24	0	0·0
11	9,681	4·0	25	1	0·0
12	6,299	2·6			
13	3,311	1·4	Total	239,943	100·0

families of 2 children, 8·2 per cent. in the case of families of 3 children, 9·1 per cent. in the case of families of 4 children, 9·2 per cent. in the case of families of 5 children, and reaching a maximum of 9·4 per cent. in the case of families of 6 children. With increasing numbers of children in the family this proportion falls; it is less than 8 per cent. for 9 children, less than 6 per cent. for 10 children, less than 3 per cent. for 12 children, and less than 1 per cent. for 14 children. Twenty or more children were born to only fifteen of these marriages, or approximately once in 16,000 marriages.

Order of birth.—The tabulation of marriages by the number of children in the family enables calculations to be made as to what proportion of children are first-born children, what proportion second-born, and so on, and figures relative to this are collected in Table II. In it two sets of figures are given, the one derived from the tabulation of all marriages existing and enumerated at the census, and the other exclusively to those marriages in which the fertile period had then been completed. Taking the children born to all existing marriages, it is found that 21·6 per cent. are first-born children; 18·4 per cent., second children; 15·0 per cent., third children; 12·1 per cent., fourth children; 9·5 per cent., fifth children; and 7·3 per cent., sixth children. Eleventh children constitute 1·0 per cent. of the total, and from there onwards the proportions rapidly decline, twelfth children constituting 0·6 per cent.; fifteenth children, 0·05 per cent.; and twentieth children, 0·001 per cent. When these proportions are studied among the children of marriages of completed fertility it is found, as might be expected, that those of the earlier-born children are less while those of the later-born children are more. For instance, first children constitute only 16·1 per cent.; second children, 15·1 per cent.; and third children, 13·8 per cent., all of which are less than found among the children of all existing marriages, while the proportion constituted by fourth children is little different—12·3 as against 12·1 per cent.—and that constituted by fifth-born children is 10·6 per cent.; by tenth-born children, 2·8 per cent.; and by fifteenth-born children, 0·09 per cent., all of which are greater than among the children of all existing marriages. Taking the children of all existing marriages, it is found that the chance, or odds in favour, of a person or child being born not later than a second child is 40 to 60; not later than a third, 55 to 45; not later than a fourth, 67 to 33; not later than a fifth, 77 to 23; not later than a sixth, 84 to 16; not later than a seventh, 89 to 11; not later than an eighth, 93 to 7; not later than a ninth, 96 to 4; not later than a tenth, 98 to 2; and not later than an eleventh, 99 to 1.

TABLE II.—*Order of birth of children.*

Order of child in family.	Marriages of completed fertility.		All marriages* existing on census day.	
	Number of children.	Per cent. of total.	Number of children.	Per cent. of total.
1st …………	212,465	16·133	588,857	21·584
2nd …………	198,365	15·062	501,624	18·386
3rd …………	181,455	13·778	410,381	15·042
4th …………	161,807	12·286	328,845	12·053
5th …………	140,048	10·634	258,852	9·488
6th …………	117,859	8·949	200,115	7·335
7th …………	95,330	7·238	150,312	5·510
8th …………	74,914	5·620	109.137	4·000
9th …………	53,785	4·084	74.911	2·746
10th …………	36,256	2·753	48,144	1·765
11th …………	22.127	1·679	28,302	1·037
12th …………	12,446	0·945	15,474	0·567
13th …………	6,147	0·467	7.452	0·273
14th …………	2,836	0·215	3,396	0·125
15th …………	1.169	0·089	1.395	0·051
16th …………	512	0·039	599	0·022
17th …………	219	0·017	258	0·009
18th …………	87	0·007	104	0·004
19th …………	34	0·002	41	0·002
20th …………	15	0·001	17	0·001
21st …………	9	0·001	9	0·000
22nd …………	6	0·000	6	0·000
23rd …………	2	0·000	2	0·000
24th …………	1	0·000	1	0·000
25th …………	1	0·000	1	0·000
Total ….	1,316,995	—	2,728,235	—

* Some marriages were excluded from all these tabulations, vide text.

Influence of woman's age at marriage on size of complete family.—This is shown both directly by the tabulation, and also indirectly by the results obtained by the correlation studies. The average number of children, as already stated, in the completed families was found to be 5·49. When the woman at the time of marriage was young the average family is found to be greater than this, but when she is older at that time it is found to be less. Thus marriages in which the wives were aged 17 at the time of marriage are found to produce families averaging 9·02 children, while that average in the case of women marrying at 40 is less than one child. At age 20 this average is 7·86; at age 25, 5·66; at age 30, 3·89; at age 35, 2·29; and at age 40, 0·86. By the application of the method of simple correlation (linear) it is found in the case of these marriages of completed fertility that the regression equation is

$$C = 14{\cdot}724 - 0{\cdot}355\ W,$$

where C = the number of children in the family, and W = the age of the wife at marriage. This equation indicates that the effect of one year's delay of marriage is to reduce the average family by fully one-third of child, or that three years' delay may be expected to result in the family being one child less. This result may be fairly correct in general, but it cannot be strictly applied, for the crude observations show that the effect of one year's delay is not constant throughout the fertile period of the woman's life, but is greater for the younger and less for the older ages. Thus a year's delay when the woman is aged from 20 to 25 averages 0·45 of a child, 0·37 when she is aged 25 to 30, 0·32 when she is aged 30 to 35, 0·29 when she is aged 35 to 40, and 0·10 when she is aged 40 to 45.

TABLE III.—*Age of wife at marriage and average size of complete family.*

Age of wife at marriage.	Average children in family.		
	Observed.	Graduated.	
		Linear regression.	Curve of second degree.
17	9·02	8·69	9·14
18	8·66	8·33	8·68
19	8·30	7·98	8·23
20	7·86	7·62	7·78
21	7·41	7·27	7·35
22	6·98	6·91	6·93
23	6·52	6·56	6·51
24	6·07	6·20	6·10
25	5·66	5·85	5·71
26	5·28	5·49	5·32
27	4·92	5·14	4·95
28	4·56	4·78	4·58
29	4·21	4·43	4·22
30	3·89	4·07	3·87
31	3·58	3·72	3·54
32	3·16	3·36	3·21
33	2·93	3·01	2·89
34	2·63	2·65	2·58
35	2·29	2·30	2·28
36	1·93	1·94	1·99
37	1·64	1·59	1·71
38	1·38	1·23	1·44
39	1·18	0·88	1·18
40	0·86	0·52	0·93
41	0·66	0·17	0·68
42	0·50	—	0·45
43	0·31	—	0·23
44	0·22	—	0·02

Influence of age of husband at marriage on average size of family.—This also may be studied in the group of marriages of completed fertility, and a scrutiny shows that the younger the husband at the time of marriage the larger is the average number of children born to the marriage. The average family of all these marriages amounts to 5·49 children. For marriages of men, or boys, aged 18 this average is 8·25, and gets less and less as the age of the husband increases. It falls below 8 when the husband is aged 20, below 7 when he is aged 23, below 6 when he is aged 26, below 5 when he is aged 30, below 4 when he is aged 34, below 3 when he is aged 39, below 2 when he is aged 46, and below 1 when he is aged 54. The apparent effect of a year's delay of marriage when the man's age is between 20 and 25 averages 0·34 of a child; when he is aged 25 to 30, 0·27; when he is aged 30 to 35, 0·23; when he is aged 35 to 40, 0·24; when he is aged 40 to 45, 0·15; when he is aged 45 to 50, 0·12; when he is aged 50 to 55, 0·09; and when he is aged 55 to 60, 0·04. The influence of delay is thus a decreasing quantity as the husband's age advances.

TABLE IV.—*Age of husband at marriage and average size of complete family.*

Age of husband.	Average children in family.		Age of husband.	Average children in family.	
	Observed.	Graduated (linear regression).		Observed.	Graduated (linear regression).
17	8·11	8·62	35	3·66	3·95
20	7·85	7·34	38	2·94	3·28
23	6·82	6·67	41	2·52	2·60
26	5·83	5·99	44	2·06	1·92
29	5·06	5·31	47	1·74	1·24
32	4·33	4·63	50	1·36	0·56

The above figures indicate a high correlation between the age of the husband at marriage and the number of children born to the marriage, one not much less than is found between the age of the wife at marriage and the number of children—calculation shows that in the case of the wife this correlation is approximately 0·58, and in the case of the husband, 0·44—and it is not without interest to find out how much of this high correlation is due to the well-known existence of a high correlation between the ages of the husband and wife at the time of marriage—found in this study to be 0·71—and how much due directly to decreasing procreative power of man with advancing years. This problem is answered by multiple correlation formula. Let C = the average number of children born, W = the age of the wife at marriage, and H = the age of the husband at marriage, and the influence of the two variables W and H on C is shown by the following three formula (calculated from lineal regressions)—

$$C = 14{\cdot}72 \quad - 0{\cdot}355\ W$$
$$C = 11{\cdot}68 \quad - 0{\cdot}226\ H$$
$$C = 14{\cdot}889 - 0{\cdot}332\ W - 0{\cdot}028\ H$$

A comparison between these three formulæ shows that when the influence of the husband's age is separated from that of the wife's age the influence of the latter is little reduced, but when the influence of the wife's age is taken away from that of the husband's age the effect is much greater, for the influence of the husband's age is thereby reduced by approximately nine-tenths. From the multiple correlation formula it may be gathered that a delay of three years on the part of the wife reduces the average size of the family approximately by one child, and that it requires a delay of something like forty years on the part of the husband to effect the same reduction.

The influence of duration of marriage on the size of the family.—To study this the figures of the tabulation of marriages of continuing fertility—*i.e.*, those in which the wife has not attained age 45—must be considered. These marriages number 440,741, and as the total number of children born to them is 1,411,240, the average family is found to amount to 3·20 children. As might be expected, the average size of family increases as the duration of marriage increases. In the third year of married life children in the family average 1·03; in the sixth year, 2·03; in the tenth year, 3·43; in the fourteenth year, 4·26; in the seventeenth year, 5·06; in the twenty-first year, 6·23; in the twenty-fourth year, 7·25; in the twenty-seventh year, 8·20; and in the thirtieth year, 9·04. These years of duration apply exclusively to fertile years, which are years of marriage previous to attainment of age 45 by the wife, and take no cognizance of the continuation of marriage after that date. The increases of these averages by all years of durations are not equal; they are relatively large in the early years, fall as the duration increases, and increase again with the longest durations. Thus the additions to the average size of family caused by the first five years of duration of married life average 0·35; those of the second five years of married life, 0·29; of the third five years, 0·26; of the fourth five years, 0·31; and of the fifth five years, 0·35.

TABLE V.—*Showing average size of family for specified age of wife at marriage at specified durations of marriage.*

Age of wife at marriage.	Duration of marriage.							
	3.	6.	9.	12.	15.	18.	21.	24.
17	1·65	2·84	3·95	4·84	5·63	6·81	7·46	8·48
20	1·72	2·78	3·71	4·74	5·52	6·07	7·00	7·20
23	1·48	2·48	3·24	4·08	4·72	5·34	5·76	—
26	1·32	2·23	2·99	3·52	3·98	4·57	—	—
29	1·21	2·03	2·53	3·05	—	—	—	—
32	1·10	1·89	2·42	2·72	—	—	—	—
35	0·91	1·35	1·94	—	—	—	—	—
38	0·64	1·15	—	—	—	—	—	—
41	0·23	—	—	—	—	—	—	—
All ages	1·39	2·29	3·06	3·75	4·33	4·89	5·42	5·76

Giving C, W and H, the same significances as in the previously quoted formulæ, and letting D = the years of duration of marriage, the following are the linear regression formulæ showing the influence of the duration on the size of family:—

$$
\begin{aligned}
C &= 0\cdot338 + 0\cdot291\ D \\
&= 2\cdot862 - 0\cdot095\ W + 0\cdot268\ D \\
&= 1\cdot968 - 0\cdot057\ H + 0\cdot280\ D \\
&= 2\cdot968 - 0\cdot076\ W - 0\cdot024\ H + 0\cdot272\ D.
\end{aligned}
$$

From these formulæ it will be seen that the calculated influence of one year of marriage is to raise the average by approximately 0·29 of a child, or, in other words, that the birth of three children may be expected on an average in each ten years of duration. It may also be seen that the effect of duration is largely a direct one and is little affected by the elimination of the influences of the ages of the parents at the time of marriage; when calculated by simple correlation the effect of one year's duration is found to be 0·29, and when calculated by multiple correlation, and the influences of the ages of the parents at marriage separated, that amount is only reduced to 0·27.

Fertility tables.—Tables for predicting the most probable fertility of marriage, or more strictly for predicting the most probable average fertility of a number of similar marriages, in the same manner as a life-table may be used for predicting the most probable duration of life, have been constructed by Mr. Rae and are incorporated in the Census Report. Short abstracts of these tables are given below. (Tables VI and VII.) These fertility tables are two in number, the one giving the most probable size of the complete family in correlation with the ages of the husband and

Table VI.—*Predicted fertility of marriage for selected ages of wife and husband. Complete families.*

[Abstracted from Mr. Rae's table (xxxviii) in *Census Report.*]

Age of husband.	Age of wife.								
	17.	20.	23.	26.	29.	32.	35.	38.	41.
17	9·58	8·24	6·85	5·41	3·92	2·38	0·79	—	—
20	9·31	8·09	6·82	5·49	4·12	2·69	1·20	—	—
23	8·99	7·88	6·72	5·51	4·25	2·93	1·57	0·15	—
26	8·60	7·61	6·56	5·46	4·31	3·11	1·86	0·56	—
29	8·15	7·27	6·34	5·35	4·32	3·23	2·10	0·91	—
32	7·63	6·87	6·05	5·18	4·26	3·29	2·27	1·19	0·07
35	7·06	6·40	5·70	4·95	4·14	3·28	2·37	1·41	0·40
38	6·42	5·88	5·29	4·65	3·96	3·21	2·42	1·57	0·67
41	5·71	5·29	4·81	4·29	3·71	3·08	2·39	1·67	0·88
44	4·95	4·64	4·27	3·86	3·40	2·88	2·32	1·70	1·03
47	4·12	3·92	3·67	3·38	3·03	2·63	2·17	1·67	1·11
50	3·23	3·14	3·01	2·83	2·59	2·30	1·97	1·58	1·14

wife at the time of marriage, and the other the most probable size of family after varying numbers of years of marriage between husbands and wives of equal age. The second table is supplemented by a formula for adjusting the figures for any difference of age there may be between the husbands and wives. In the short tables given, only figures relative to every third year of age and every third year of duration are given; but in the original tables, those in the Census Report, figures for all years are shown.

The formulæ used by Mr. Rae in the construction of these tables were as follows, the first being that used for the construction of the table of completed fertility, and the second for the table of continuing fertility:—

$$C_{WH} = 20{\cdot}149493 - {\cdot}555812\,W - {\cdot}173804\,H$$
$$- {\cdot}002840\,W^2 - {\cdot}003494\,H^2 + {\cdot}012675\,W\,H.$$
$$C_{WHD} = 6{\cdot}571791 - {\cdot}207399\,W - {\cdot}087090\,H + {\cdot}314894\,D$$
$$+ {\cdot}004307\,W^2 + {\cdot}000955\,H^2 - {\cdot}002118\,D^2.$$

The quantity to be added to the numbers in the table of continuing fertility, for differences of age between husbands and wives, is:—

$$(H-W)\,\{- {\cdot}087090 + {\cdot}000955\,(H + W)\}.$$

The figures in these tables are found to correspond fairly closely with the crude figures of the observations, and have the advantage over them of smoothness, the oscillations constantly associated with crude figures of observation having been eliminated. Reading the figures of these tables would to a large extent be a repetition of what I have already tried to demonstrate, for they deal with the same statistical facts as those already considered. They show, for instance, the greater influence of the wife's age than of the husband's age on the average size of the family; they show the varying influence of delay of marriage; and they show other facts already drawn attention to.

TABLE VII.—*Predicted fertility of marriage at end of specified durations, ages of husband and wife being the same.*

[Abstracted from Mr. Rae's table (xlv) in *Census Report.*]

Years of duration of marriage.	Age of wife and husband.								
	17.	20.	23.	26.	29.	32.	35.	38.	41.
1	2·02	1·45	0·98	0·60	0·31	0·12	0·03	0·03	0·12
4	2·93	2·36	1·89	1·51	1·22	1·03	0·93	0·93	1·03
7	3·80	3·23	2·75	2·37	2·09	1·90	1·80	1·80	—
10	4·63	4·06	3·59	3·21	2·92	2·73	2·63	—	—
13	5·42	4·85	4·38	4·00	3·71	3·52	—	—	—
16	6·18	5·61	5·13	4·75	4·47	—	—	—	—
19	6·89	6·32	5·85	5·47	—	—	—	—	—
22	7·57	7·00	6·53	—	—	—	—	—	—
25	8·21	7·64	—	—	—	—	—	—	—
28	8·81	—	—	—	—	—	—	—	—

Sterile marriages.—Of the 239,943 marriages in which the fertile period was complete at the date of the census, 27,478, or 11·5 per cent., were sterile, and 212,465, or 88·5 per cent., were fertile. The percentage of marriages found to be completely sterile varies with the age of the wife at marriage, the older that age the higher being the rate. Among marriages in which the wife is aged 17 to 19 at the time of marriage this rate is found to be less than 3 per cent.; when that age is 22 or less the rate is less than 5 per cent.; for age of wife at marriage 25, the rate is 7 per cent.; for age 28, 10 per cent.; for age 30, 13 per cent.; for age 35, 25 per cent.; for age 40, 57 per cent.; and for age 43, more than 80 per cent.

For studying the question of the chance of fertility of marriage after specified periods of sterility recourse to averaging marriages of several years of age of the wife was found to be necessary, for, on account of comparative paucity of numbers, figures dealing with single years of that age were found to oscillate too much to show conclusions. Marriages of continuing fertility, and which were of wives who at the time of marriage were aged 20 to 25, were selected for this purpose, and in all numbered 245,221.

TABLE VIII.—*Proportion of fertile and sterile marriages by age of wife at marriage.*

Age of wife at marriage.	Fertile marriages.		Sterile marriages.	
	Number.	Per 100.	Number.	Per 100.
17	2,846	97·4	77	2·6
18	6,213	97·7	149	2·3
19	10,574	97·0	324	3·0
20	17,420	96·4	646	3·6
21	17,634	96·4	663	3·6
22	18,748	95·6	859	4·4
23	18,439	94·9	983	5·1
24	17,693	94·3	1,077	5·7
25	16,279	93·3	1,178	6·7
26	14,042	92·5	1,131	7·5
27	12,232	91·3	1,167	8·7
28	10,439	90·2	1,129	9·8
29	8,454	88·4	1,113	11·6
30	7,920	87·2	1,165	12·8
31	5,796	86·6	896	13·4
32	5,048	83·1	1,024	16·9
33	4,239	81·3	976	18·7
34	3,561	79·0	949	21·0
35	3,103	75·3	1,019	24·7
36	2,552	70·5	1,067	29·5
37	2,039	66·0	1,052	34·0
38	1,676	58·6	1,182	41·4
39	1,359	54·5	1,134	45·5
40	1,031	42·9	1,370	57·1
41	689	35·7	1,242	64·3
42	486	27·2	1,302	72·8
43	279	18·4	1,238	81·6
44	213	14·0	1,312	86·0

Of these marriages, those of women aged 20 to 25, 73·3 per cent. were found to be childless when the duration was reported to be less than one year, 36·7 when it was reported to be more than one but less than two years, 15·9 when more than two but less than three years, 10·0 when more than three but less than four years, and less than 10 per cent. when the duration exceeded four years. In each thousand of these marriages a first child was born during the first year in 267 instances; during the second year in 366, during the third year in 208, during the fourth year in 53, during the fifth year in 15, and during each subsequent year in 10 or less.

Of a thousand marriages childless at the end of the first year, 500 are found to become fertile before the end of the second year, and of each 1,000 childless at the end of the second year, 566 become fertile before the end of the third year. After the third year this proportion falls; the proportion of previously childless wives having children during the fourth year is 334 per 1,000; during the fifth year 141 per 1,000: during the sixth year, 80 per 1,000; and less in the ninth and tenth years. In Table IX, where the chances of birth among childless women after varying durations of marriage are shown, oscillations in some of the later years are evident: these oscillations are probably not significant of real differences, but attributable to paucity of observation.

TABLE IX.—*Showing chance of fertility during first ten years of married life.*

Year of marriage.	Per 100,000 marriages.		Childless at beginning of year but subsequently fertile.	Chance of 1st birth during year.	Chance of 1st birth during year or later.
	Sterile at beginning of year.	Fertile at end of year.			
1st	100,000	26,700	94,702	·267	·947
2nd	73.300	63.314	68,002	·500	·928
3rd	36,686	84,073	31.388	·566	·856
4th	15,927	89.398	10,629	·334	·667
5th	10,602	90,891	5,304	·141	·500
6th	9,109	91.621	3,811	·080	·418
7th	8.379	92.636	3,081	·121	·368
8th	7,364	93,288	2,066	·089	·281
9th	6,712	93,603	1,414	·047	·211
10th	6,397	94,040	1,099	·068	·172
Subsequent years	5,960	94.702	662	—	·111

From the same set of figures the chances of fertility after a childless period of marriage at any subsequent time may be calculated. The chance of fertility at the time of marriage among women of these ages is found to be 0·947: at the commencement of the second year, or, for it is the same, at the end of the first year, it is 0·928; at the end of the second year, 0·856: at the end of the third year, 0·667: at the end of the fourth year, 0·500: at the end of the fifth year, 0·418; at the end of the sixth year, 0·368; at the end of the seventh year, 0·281; at the end of the eighth year, 0·211; at the end of the ninth year, 0·172; and at the end of the tenth year, 0·111. Thus the probability of a child after a childless period in these marriages is more than a level chance when the marriage has not lasted for more than four years, but after the expiry of four years it is less than a level chance, and steadily decreases as the duration increases.

Occupational fertilities.—This term is adopted to describe the fertility of groups of marriages associated with particular occupations, or groups of occupations, of the husbands. For the studying of it recourse was had to sampling, as a full tabulation for the fertilities of each occupation, such as was made of all marriages, by reason of length and complexity, was practically an impossibility. The samples taken from the tabulation cards of each occupation included all marriages in which the wives were aged at the time of marriage more than 22 but less than 27, and of which the durations were at least fifteen years. This group of ages was selected because it includes the years of age most frequently associated with the marriage of women. The limit of fifteen years' duration was taken to exclude the majority of marriages to which the complete families had not been born, and to include the majority of those to which the complete families were born. Stricter limits might have been taken, but by seriously reducing numbers they would not have been entirely advantageous. In all 133,960 marriages, and 779,301 children were dealt with in this tabulation. These were divided into 142 occupational groups. The average family in all these selected marriages is 5·82.

For each occupational group the number of families of each size of family was counted, and from the figures thus got the total number of children in each of the occupational groups, and the average number of children in all the marriages of the groups, were calculated.

Although in some of the occupational groups the number of marriages dealt with was large, this was not always so, and some method of differentiating significant differences from differences due to sampling variations was necessary. The method adopted for this was to ascertain the differences of the mean size of family of all the marriages included in the study and of the marriages in the groups, and only to accept differences as significant when the amounts were at least three times as great as their probable errors. The formula used for calculating the probable errors of the differences between these means was—

$$e = 0 \cdot 6745 \sqrt{\frac{\Sigma^2}{N} + \frac{\sigma^2}{n}\left(1 - \frac{2n}{N}\right)}$$

where $\Sigma =$ the standard variation of the general mean, $\sigma =$ the standard variation of the mean of the group, $N =$ the number of marriages in the study, and $n =$ the number of marriages in the group.

By the use of this test the occupational groups were divided into three classes, those with an average family significantly greater than the general mean, those with an average family neither significantly greater nor significantly less than the general mean, and those with an average family significantly less than the general mean.

Figures relative to the whole 142 groups are published in the Census Report, but for brevity here I only reproduce figures relative to the average family of those occupational groups of which that average is significantly large, or significantly small, omitting all reference to the numbers of families of specified size, and figures relative to the average families of those groups of which the averages are not significantly different from the general mean.

TABLE X.—*Occupational fertilities. Showing occupational groups with fertilities significantly greater and significantly less than the general mean.*

Occupations or occupational groups.	Number of marriages.	Mean number of children.	Standard variation.	Difference from general mean $(m-M)$	Probable error of difference (e)	Ratio: $\frac{m-M}{e}$
1. Occupations in which fertility is *significantly greater* than the general mean.						
Crofters	2,669	7·04	2·9228	1·22	0·0382	31·94
Plasterers' labourers	96	7·01	3·1507	1·19	0·2169	5·49
Coal, shale and ironstone miners	9,182	7·01	3·0882	1·19	0·0213	55·87
Old age pensioners (occupation not stated)	203	6·95	3·3058	1·13	0·1563	7·23
Fishermen-crofters	722	6·93	2·6754	1·11	0·0671	16·54
Coalheavers, coal porters, labourers	262	6·61	3·2786	0·79	0·1364	5·79
Glaziers	72	6·49	2·7333	0·67	0·2173	3·08
Agricultural labourers, farm servants	4,063	6·42	3·0467	0·60	0·0324	18·52
Coal, shale, &c., mine owners, agents, managers	251	6·41	2·8820	0·59	0·1227	4·81
Fishermen	2,887	6·41	3·1020	0·59	0·0387	15·25
Ship—platers and other workers (in iron)	1,442	6·38	3·0697	0·56	0·0544	10·29
Stone, slate miners, dressers, quarriers	1,104	6·38	3·0951	0·56	0·0629	8·90
Shepherds	928	6·35	3·0176	0·53	0·0668	7·93
Navvies, mine sinkers, road labourers	1,147	6·33	3·1812	0·51	0·0629	8·11
Builders', bricklayers', masons' labourers	740	6·31	3·1792	0·49	0·0786	8·11
General labourers	2,092	6·29	3·3000	0·47	0·0482	9·75
Iron and steel manufacture	1,994	6·26	3·0398	0·44	0·0457	9·63
Others in agriculture	352	6·25	3·0346	0·43	0·1092	3·94
Scavenging and disposal of refuse	266	6·23	3·2112	0·41	0·1325	3·09
Manufacturing chemists	374	6·21	2·9550	0·39	0·1029	3·79
Farmers, graziers	4,846	6·20	3·0701	0·38	0·0294	12·93
Dock, quay labourers	1,109	6·19	3·2539	0·37	0·0658	5·62
Plasterers	353	6·17	2·9512	0·35	0·1014	3·45
Retired from business (not army or navy)	5,772	6·17	3·3719	0·35	0·0294	11·90
Builders, bricklayers, masons	2,513	6·16	2·9816	0·34	0·0399	8·52
Farm—grieves, foremen	1,285	6·16	2·9799	0·34	0·0540	6·30
Engine—drivers, stokers, &c. (not railway or marine)	1,474	6·15	3·0610	0·33	0·0535	6·17
Ironfounders	2,367	6·08	3·0696	0·26	0·0426	6·10
Blacksmiths, strikers	2,609	6·00	3·0596	0·18	0·0405	4·44
Road transport service	4,818	5·91	3·0214	0·09	0·0294	3·06

Table X.—*Occupational fertilities.—Contd.*

Occupation or occupational groups.	Number of marriages	Mean number of children.	Standard variation.	Difference from general mean $(m-M)$	Probable error of difference (e)	Ratio : $\frac{m-M}{e}$
2. Occupations in which fertility is *significantly less* than the general mean.						
Tailors; dress, stay, shirt makers	1,966	5·68	3·0711	−0·14	0·0467	3·00
Carpenters, joiners	3,599	5·62	2·8959	−0·20	0·0324	6·17
Railway service	5,078	5·59	2·9732	−0·23	0·0278	8·27
Painters, paperhangers, decorators	1,297	5·57	3·0215	−0·25	0·0564	4·52
Erectors, fitters, turners	1,758	5·54	2·9275	−0·28	0·0467	6·00
Flax, linen manufacture	625	5·52	3·0116	−0·30	0·0812	3·69
Butchers, fishmongers, game dealers	1,221	5·49	2·9917	−0·33	0·0576	5·21
Plumbers, gasfitters	1,043	5·45	2·9107	−0·37	0·0607	6·10
Labourers and other or undefined workers in engine and machine making	2,936	5·45	2·9390	−0·37	0·0405	9·14
Manufacture of mixed or unspecified textile materials	923	5·44	2·9565	−0·38	0·0654	5·81
Furniture makers, dealers	1,402	5·44	2·9932	−0·38	0·0540	7·04
Insurance agents	620	5·34	3·0893	−0·48	0·0837	5·73
Police	642	5·33	2·7544	−0·49	0·0727	6·74
Stationery manufacture, paper bag makers, workers in paper	128	5·33	2·6958	−0·49	0·1607	3·05
Pattern makers	375	5·32	2·8161	−0·50	0·0977	5·12
Waiters (not domestic)	123	5·24	2·9825	−0·58	0·1814	3·20
Coppersmiths	103	5·24	2·9034	−0·58	0·1930	3·01
Domestic outdoor service	2,598	5·20	2·8855	−0·62	0·0381	16·27
Greengrocers, fruiterers	329	5·19	3·2378	−0·63	0·1154	5·46
Hairdressers	226	5·15	2·8519	−0·67	0·1340	5·00
Wool and worsted manufacture	1,037	5·14	2·9232	−0·68	0·0553	10·33
Indiarubber, guttapercha workers	206	5·12	2·9190	−0·70	0·1373	5·10
Municipal, parish and other local or county officers	668	5·07	3·0054	−0·75	0·0784	9·57
Postmen, other Civil Service messengers	563	5·06	2·8485	−0·76	0·0704	10·80
Dealers in hardware, metals, machines	488	5·03	3·0867	−0·79	0·1315	6·01
Barmen, cellarmen	248	4·99	2·7460	−0·83	0·1176	7·06
Land, house, ship surveyors	57	4·98	2·8322	−0·84	0·2530	3·32
Electric fitters, electricians (undefined)	276	4·97	2·8633	−0·85	0·1162	7·31
Caretakers, &c. (not Government)	498	4·96	3·2848	−0·86	0·0992	8·67
Others connected with education	203	4·94	3·1083	−0·88	0·1472	5·98
Eating-house, boarding-house keepers	146	4·90	2·9856	−0·92	0·1666	5·52
Grocers; tea, coffee, provision dealers	1,772	4·87	2·6289	−0·95	0·0421	22·57

TABLE X.—*Occupational fertilities.*—*Contd.*

Occupations or occupational groups.	Number of marriages.	Mean number of children.	Standard variation.	Difference from general mean ($m-M$)	Probable error of difference (e)	Ratio: $\frac{m-M}{e}$
Printers, lithographers, bookbinders	1,316	4·87	2·7626	−0·95	0·0514	18·48
Scientific, surgical and photographic instrument and apparatus makers	146	4·85	2·9198	−0·97	0·1630	5·95
Indoor service (domestic, club, institution)	293	4·84	2·8955	−0·98	0·1141	8·59
Innkeepers, publicans, wine and spirit merchants, agents	990	4·78	2·8580	−1·04	0·0611	17·02
Watchmakers, dealers in jewellery, &c.	398	4·77	2·7189	−1·05	0·0920	11·41
Publishers, booksellers, stationers	421	4·75	2·8671	−1·07	0·0942	11·36
Navigation service (on shore)	149	4·74	3·0125	−1·08	0·1665	6·49
Private means	434	4·71	3·2301	−1·11	0·1043	10·64
Drapers, clothiers, hosiers	1,334	4·68	2·7917	−1·14	0·0514	22·16
Commercial occupations	2,515	4·63	2·7943	−1·19	0·0337	35·31
Tobacco manufacturers, dealers	135	4·53	2·6044	−1·29	0·1512	8·53
Soldiers and Non-commissioned officers	60	4·52	2·4869	−1·30	0·2166	6·00
Men of the navy and marines	42	4·48	3·0802	−1·34	0·3203	4·18
Civil, mining engineers	106	4·43	2·6027	−1·39	0·1706	8·15
Chemists, druggists	228	4·39	2·7116	−1·43	0·1212	11·80
Clerks (Civil Service, law, commercial, bank and insurance)	3,390	4·38	2·6914	−1·44	0·0309	46·60
Ministers, clergymen	598	4·33	2·8399	−1·49	0·0784	19·01
Art, music, drama	560	4·27	2·8584	−1·55	0·0815	19·02
Schoolmasters, teachers	763	4·25	2·6573	−1·57	0·0647	24·27
Literary and scientific pursuits	162	4·09	2·7875	−1·73	0·1478	11·71
Veterinary surgeons	33	4·00	2·8391	−1·82	0·3333	5·46
Advocates, solicitors	403	3·92	2·5859	−1·90	0·0869	21·86
Physicians, surgeons	285	3·91	2·6726	−1·91	0·1068	17·88
Dentists (including assistants)	51	3·86	2·2753	−1·96	0·2149	9·12
Army officers (effective and retired)	86	3·76	2·5282	−2·06	0·1840	11·20

A scrutiny of the tables here given shows that among the groups of high fertility, labouring, mining, and agricultural occupations predominate, while among those of low fertility are included professional occupations, and some of the more skilled manual occupations. Crofters and coal miners are found to have average families of more than seven children, while the families of the legal and medical professions, and of army officers, average less than four children. The following are a few notes about some of the occupational groups.

Professional and allied occupations. These without exception are found to be occupations of low fertility, and to have average families significantly less than the general mean and among them may be mentioned the clerical, legal, medical, and teaching professions, officers of the army and navy, artists, men with literary and scientific pursuits, land surveyors, civil engineers, dentists, veterinary surgeons, and pharmaceutical and dispensing chemists. The occupational groups named in Table X are arranged in order of magnitude of the crude average family, and it may there be noticed that of the twelve named as having the smallest families eleven are professional, while the twelfth, consisting of civil service, law, and other clerks is closely allied thereto.

Labouring classes. These are in marked contrast to the foregoing for the majority are found to be of high fertility. Table X shows that coal heavers, navvies, builders' labourers, dock labourers, and general labourers, all constitute occupational groups with average families significantly greater than the general mean.

Agricultural and fishing occupations. The majority of these are found to be of high fertility, some are found to be of fertility not significantly different from the general mean, but none are found to be of low fertility. Among those of significantly high fertility there are crofters, fishermen-crofters, agricultural labourers, fishermen, shepherds, farmers, and farm grieves and foremen. Among those with fertilities not significantly different from the general mean there are foresters, nurserymen and dairymen.

Workers in mines and quarries. These are found to be of significantly high fertility, and include coal and shale miners, stone and slate miners, and stone dressers and quarriers.

Transport workers. Dividing these into three groups it is found that one, carters and other workers in road transport, are of significantly high fertility, one, railway servants, are of significantly low fertility, while the third, which includes seamen and others concerned with transport by water, is of a fertility neither significantly greater nor significantly less than the general mean, the class excluded from Table X.

Commercial and clerking occupations. These are all found to be of significantly low fertility. Among them may be mentioned insurance agents, clerks (civil service, law, commercial, bank, and insurance), and persons engaged in commerce.

Tradesmen. A general scrutiny of results shows that tradesmen are found in all three classes of fertility, high, low, and not significantly different from the mean. Among those of high fertility may be mentioned glaziers, plasterers, masons and builders, ironfounders, blacksmiths, and engine drivers and stokers (not railway or marine), and among those of low fertility, tailors, carpenters, painters, engineers, patternmakers, plumbers, coppersmiths, hairdressers, electricians, instrument makers, and printers.

Domestic and allied services. Occupations of this nature are found without exception to be of low fertility, and to have average families which are significantly less than the general mean. Among them are indoor and outdoor domestic servants, waiters, barmen, innkeepers, publicans, and keepers of boarding, lodging and eating houses.

Public services. Occupations connected with these services, with the exception of scavengers, are found either to have fertilities not significantly different from the general mean, or to have low fertilities. The average fertility of scavengers is found to be high, or at least significantly greater than the general mean. Occupations of this class with low fertility include police, postmen, municipal and parish officers, soldiers, and men of the Royal Navy.

Declining national fertility.—That the fertility of marriage has been decreasing in Scotland may be accepted as an established statistical fact, it having been evidenced by a continuing fall of

TABLE XI.—*Fertility of marriage by Calendar year of marriage.*

Age of wife at marriage.	Periods of marriage.									
	1864 and before.	1865 to 1869.	1870 to 1874.	1875 to 1879.	1880 to 1884.	1885 to 1889.	1890 to 1894.	1895 to 1899.	1900 to 1904.	1905-06.
20	8·48	8·42	8·04	7·88	7·59	7·39	—	—	—	—
21	8·18	8·00	7·82	7·38	7·10	7·00	—	—	—	—
22	7·72	7·52	7·41	7·04	6·81	6·47	—	—	—	—
23	7·40	7·38	7·04	6·59	6·39	5·97	—	—	—	—
24	6·86	6·87	6·66	6·18	5·96	5·68	5·42	—	—	—
25	6·73	6·51	6·24	5·94	5·68	5·23	5·03	—	—	—
26	6·17	6·13	5·96	5·54	5·28	4·98	4·69	—	—	—
27	5·80	5·65	5·82	5·39	5·05	4·60	4·37	—	—	—
28	5·66	5·35	5·45	4·95	4·73	4·30	4·07	—	—	—
29	5·74	5·00	4·98	4·64	4·37	4·19	3·75	3·53	—	—
30	4·94	4·89	4·71	4·43	4·03	3·82	3·48	3·32	—	—
31	4·83	4·39	4·33	4·29	3·71	3·59	3·30	3·04	—	—
32	4·41	3·99	3·84	3·83	3·60	3·10	2·90	2·70	—	—
33	4·00	3·22	3·38	3·68	3·26	3·15	2·77	2·51	—	—
34	3·38	3·68	3·16	3·29	3·16	2·62	2·59	2·23	2·19	—
35	3·82	3·10	2·87	2·87	2·77	2·52	2·30	1·98	1·74	—
36	2·33	2·85	2·60	2·39	2·54	2·05	1·93	1·75	1·55	—
37	3·88	2·00	1·93	2·11	2·02	1·92	1·59	1·42	1·46	—
38	3·13	3·00	2·02	1·66	1·73	1·79	1·41	1·28	1·10	—
39	1·75	2·17	2·16	1·44	1·62	1·48	1·27	1·12	0·97	0·84
40	—	2·00	1·13	1·12	1·18	1·07	0·94	0·85	0·70	0·67

the national birth-rate. It is of some interest, however, to note that figures derivable from this study demonstrate the fact in a clear and conclusive manner.

The tabulation cards of all marriages of completed fertility, *i.e.*, of marriages in which the wife had attained age 45, were taken and sorted into groups according to the year in which the marriage was celebrated. The cards of each group were then counted for the marriages recorded on them and for the number of children born to them, and from the figures thus got the complete average fertility for each age of wife and for each calendar year were ascertained. Figures for single years are published in Table XLVI of the Census Report, and from that table those collected in Table XI have been abstracted.

TABLE XII.—*Showing decline of fertility in twenty years. (Complete families).*

Age of wife at marriage.	Marriages of earlier years.		Marriages of later years.		Decline.
	Date.	Average family.	Date.	Average family.	
20	1866	8·38	1886	7·34	1·04
21	1867	8·01	1887	6·92	1·09
22	1868	7·54	1888	6·34	1·20
23	1869	7·32	1889	5·89	1·43
24	1870	7·00	1890	5·42	1·58
25	1871	6·26	1891	4·85	1·41
26	1872	6·11	1892	4·61	1·50
27	1873	5·85	1893	4·18	1·67
28	1874	5·08	1894	3·97	1·11
29	1875	4·91	1895	3·53	1·38
30	1876	4·57	1896	3·22	1·35
31	1877	4·35	1897	2·87	1·48
32	1878	3·48	1898	2·66	0·82
33	1879	3·76	1899	2·40	1·36
34	1880	3·44	1900	2·19	1·25
35	1881	2·80	1901	1·69	1·11
36	1882	2·40	1902	1·68	0·72
37	1883	2·38	1903	1·18	1·20
38	1884	1·73	1904	0·92	0·81
39	1885	1·78	1905	0·84	0·94
40	1886	1·09	1906	0·55	0·54

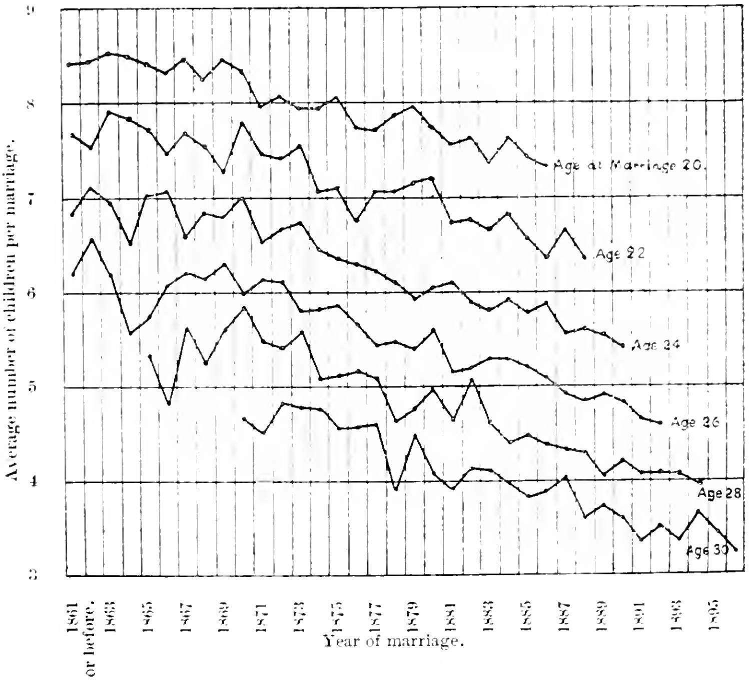
The average complete fertility of wives married at 20 previous to 1864 was 8·48; in the quinquennium 1865–69 this fell to 8·42; in the period 1870–74 to 8·04; in the period 1875–79 to 7·88; in the period 1880–84 to 7·59; for the year 1885 it was 7·45; and for the year 1886, 7·34. The figures for this age at marriage for later years are not available for age 45 had not been attained by the wives at the date of the census. Taking age of wife at marriage 25, a similar drop is found; the average family of such marriages dating previous to 1865 was 6·73, but this has steadily fallen; for the period 1865–69 it was 6·51; for 1870–74, 6·24; for 1875–79 5·94; for 1880–84, 5·68; and for 1885–89, 5·23. For age at marriage 30 the same is found; the average family of the earliest marriages was 4·94; for period 1870–74, 4·71; for 1880–84, 4·03; and for 1890–94, 3·48.

Again comparing the average complete family for each age of wife of the most recent year available with the corresponding figure for marriages dating twenty years further back, a universal drop is found; it amounts to more than one child per marriage for all ages of wife at marriage under 36, age 32 excepted. The figures of this comparison are collected in Table XII.

The fall of the fertility of marriage within recent years is shown graphically for a few selected years in the chart which is here reproduced.

Marriage fertility since 1861.

Note. The numbers indicated on this chart are based on marriages that took place in the years mentioned and continued until 1911, and are restricted to those in which the fertile period had been completed.



Child mortality in families of working mothers.—In the census schedule householders were instructed to state how many children born to existing marriages were alive at the time of the census, and by comparing that number with the total born the number then deceased could be ascertained. All reported information on this matter was not, however, of value as indicative of child mortality, for many of the marriages were of long duration, a considerable number had existed for upwards of sixty years, and with such the death of children born is in no way indicative of death during childhood. It was consequent on this consideration that for this purpose only marriages of less than fifteen years' duration were considered.

In Scotland married women with remunerative occupation are not numerous; they in all at the census only numbered 31,465, and as of them only 5,458 were married for less than fifteen years and enumerated on the same schedules as their husbands, the material for making this study was very limited.

The method adopted was one of sampling. The tabulation cards, for other purposes, were grouped by duration of marriage and by age of wife, and the piles were examined for the cards relative to occupied married women, and when each such card was found the card next to it was laid aside as a sample of a marriage in which the wife was not occupied. Each group, working mothers and

TABLE XIII.—*Mortality in families of working mothers.*

[Marriages of less than fifteen years' duration.]

Occupations.	Marriages.	Children.			Percentage.	
		Total.	Living.	Deceased.	Living.	Deceased.
Mothers not working	5,458	13,970	11,908	2,062	85·2	14·8
Mothers working	5,458	12,881	9,790	3,091	76·0	24·0
Domestic servants	102	128	92	36	71·9	28·1
Charwomen	193	468	333	135	71·2	28·8
Laundry workers	138	298	221	77	74·2	25·8
Farm servants	152	293	245	48	83·6	16·4
Cotton manufacture	149	364	254	110	69·8	30·2
Wool and worsted manufacture	271	748	619	129	82·8	17·2
Flax, linen manufacture	190	383	318	65	83·0	17·0
Hemp, jute manufacture	1,554	4,618	3,268	1,350	70·8	29·2
Tailors	51	90	67	23	74·4	25·6
Dressmakers	156	274	232	42	84·7	15·3
Seamstresses	55	121	99	22	81·8	18·2
Hawkers	205	560	405	155	72·3	27·7
Others	2,242	4,536	3,637	899	80·2	19·8

not-working mothers, consisted of 5,458 records. The total children born to marriages the wives of which were not working numbered 13,970, and to marriages of which the wives were working, 12,881. Of the children of the unoccupied mothers 2,062, or 14·8 per cent., were reported to be dead, while of those of the working mothers 3,091, or 24·0 per cent., were reported to be dead. Thus mortality among the children of occupied married women, or at all events among those living along with their husbands, is approximately 62 per cent. higher than among the children of mothers without remunerative occupation.

In Table XIII figures relative to the individual occupations of the mothers are given, but these on account of smallness of numbers are not very trustworthy.

Previous statistical studies on fertility of marriage.—As this is the first census of Scotland in which details regarding the fertility of marriage have been collected, the best of all facts for comparison, those of a previous study made on similar lines from similar material, are wanting. The tabulation of the fertility facts of the census in England and Wales is not yet published and not yet available for comparison, and that of the Irish census, though published, is also not available for ready comparison because it has been made on very different lines and it does not show many of the points I have been discussing.

Among recent work on the fertility of marriage, and more especially on the decline of that fertility, I may mention the paper by Drs. Newsholme and Stevenson which was read before this Society in 1906, and a contribution by Mr. McKinlay, staff clerk in the Statistical Department of the Office of the Registrar-General for Scotland, and published as a supplement to the Detailed Annual Report of the year 1908. Both these papers clearly demonstrated a decline of the birth-rate, and one which is not entirely associated with delay of marriage, and to that extent their work is fully corroborated by this study.

In Sir Timothy Coghlan's essay on the *Decline of the Birth-rate*, I find some statistical facts given in a manner comparable to those now advanced. Perhaps the most interesting of them is a tabular statement showing the decline in the size of the complete family during recent years. Sir Timothy Coghlan's figures refer to grouped ages at marriage and to grouped years of date of marriage, and for comparison I have collected the census figures into similar groups, and the two sets of figures may be seen in Table XIV. Sir Timothy Coghlan's figures refer to marriages in New South Wales. A scrutiny of his table, while showing that his averages are rather higher than those found by this census in Scotland, clearly shows that the declines in the two countries have been generally similar, though greater in New South Wales than in Scotland. For instance, the average family of women marrying at 20 to 24 in New South Wales has decreased from 8·32 to 7·02, and during the same period in Scotland from 7·80 to 7·03, the total decrease in the period in New South Wales being 1·30, and in Scotland 0·77. Again, taking ages at marriage 25 to 29, the average family in New South Wales has decreased from 6·41 to 4·97, and during the same period in Scotland from 6·14 to 5·09, the decline in the former country being 1·44, and in the latter 1·05.

TABLE XIV.—*Comparing decline of fertility in New South Wales and in Scotland.*

[Averages show size of completed families. Scottish figures relative to period 1861 to 1865 contain some earlier marriages.]

Years of marriage.	Age of wives at marriage.					
	20 to 24.		25 to 29.		30 to 34.	
	N.S.W.	Scotland.	N.S.W.	Scotland.	N.S.W.	Scotland.
1861–65	8·32	7·80	6·41	6·14	4·64	4·48
'66–70	8·10	7·67	6·45	5·95	4·38	4·24
'71–75	7·52	7·30	5·89	5·75	4·15	4·10
'76–80	7·02	7·03	5·39	5·39	3·92	3·98
'81–85	....	6·75	4·97	5·09	3·40	3·60
'86–90	....	...	....	4·72	3·03	3·37
'91–95	....	...	....	....	....	3·04

In Sir Timothy Coghlan's essay, on p. 15, there is given a table showing the proportion of marriages which prove sterile at varying ages of the wife at marriage. In Table XV, I reproduce some of his figures, and for purposes of comparison add corresponding figures derived from the census records. Sir Timothy Coghlan's figures were based partly on census returns and partly on the records pertaining to the deaths of married women. Again in this table the conclusions in the two countries are very similar. There is the same increase in the sterility rate with increasing age at marriage, and the rates for each age of wife, more especially when those of Scotland are compared with those of New South Wales for the years 1881–90, are not very different.

TABLE XV.—*Comparing frequency of sterility in New South Wales and in Scotland.*

[Figures show proportion of sterile marriages in 1,000 marriages.]

Age of wife at marriage.	New South Wales.				Scotland, Census 1911.
	1861-70.	1871-80.	1881-90.	1891-97.	
20	30	28	34	52	36
25	37	52	59	81	67
30	77	103	127	148	128
35	155	199	261	294	247
40	281	425	496	590	571

Sir Timothy Coghlan also gives a table showing the periods elapsing between marriage and the date of the first birth. His figures are not strictly comparable with what I have given in Table IX, because in my table the calculations were made for all wives, while his were made for fertile wives only. I have, however, recalculated my figures, and in Table XVI give a fair comparison between his figures and mine. The most evident difference between the two sets of figures is an apparent delay in Scotland of the birth of the first child, they are fewer during the first year, and more numerous during the third year, in Scotland than in New South Wales. The small proportion born after three years of marriage in the two countries are very similar.

TABLE XVI.—*Comparing period of marriage elapsing before birth of first child in New South Wales and in Scotland.*

[Figures show the numbers of such events in 1,000 marriages.]

Period.	New South Wales. Coghlan.	Scotland. Census 1911.	Scotland, 1855. Lewis.
Less than 1 year	428·4	283·9	220·2
1 to 2 years	396·7	389·3	613·0
2 ,, 3 ,,	91·3	220·8	111·2
3 ,, 4 ,,	33·3	56·6	28·2
4 ,, 5 ,,	17·5	15·9	11·3
5 ,, 6 ,,	9·0	7·8	5·5
6 ,, 7 ,,	6·4	10·8	4·2
7 ,, 8 ,,	4·3	6·9	1·8
8 ,, 9 ,,	3·7	3·4	1·1
9 ,,10 ,,	2·8	4·7	0·7
More than 10 years	6·5	7·0	2·8

In Table XVI, I also give some figures referring to the same point, the time elapsing between marriage and the birth of the first child, taken from Dr. Lewis' book and based on the Scottish birth registers of 1855. They agree with the figure of this census, and with the New South Wales figures, so far as showing the comparative unfrequency of first birth after three years of marriage, but they disagree with both other series as to the relative frequency of first birth in the first three years of marriage.

Sir Timothy Coghlan's tabulation of children in New South Wales by order of birth is referred to later.

The Scottish birth registers of 1855, the first year of compulsory national registration, contain information regarding the ages of the mothers, and the numerical order in the family of the children, but later registers do not do so. Dr. Matthews Duncan many years ago, and more recently Dr. C. J. Lewis, with the co-operation of his brother Mr. J. N. Lewis, have made and published statistical studies of that information, and in their work I find some figures comparable with those of this census. Dr. Duncan confined his research to the birth registers of Edinburgh and Glasgow, but Dr. Lewis extended his research so as to include all births registered in Scotland during that year. Dr. Lewis' figures being the more comprehensive are those I here use.

Dr. Lewis gives a table showing the distribution of all children registered in Scotland during the year 1855 according to their order in the family, in fact very similar to Table II of this Paper. Sir Timothy Coghlan also gives one, and for comparison, in Table XVII, I have assembled the figures for Scotland in 1855, for Scotland at the present time, and for New South Wales. The interest in this table, and more particularly in the comparison of the figures for Scotland in 1855 and those of the present census, lies in the fact that the greater the fertility of marriage, the greater will be the proportion of children belonging to the higher orders, and the less the proportion in the lower or earlier orders. Consequently, if since 1855 there has been any marked decrease in the fertility of marriage in Scotland it should be shown by an increase in the proportion of first and second children, and a decrease in the proportion of those born later in the families. This is found to be the case. A comparison between Dr. Lewis' figures and those of this census shows that the proportion of children who are first children has increased from 19·0 per cent. to 21·6 per cent., and of those who are second children from 16·1 per cent. to 18·4 per cent., while there have been decreases in the proportions of children born later than second children. Thus in 1855 third births constituted 15·4 per cent.; fourth births, 12·7 per cent.; and fifth births, 10·5 per cent., while at this census these proportions were 15·0, 12·1, and 9·5 per cent. respectively. The principal declines are found in the case of children extending from fourth to the ninth in the families, for children who are tenth or more now constitute nearly the same proportion among all children as they did in 1855, these proportions being 3·9 and 3·8 respectively. The figures given in Table XVII applicable to New South Wales generally lie between the Scottish figures of 1855 and those of the present date, they however show a larger proportion of children of the higher orders, of children born later than ninth, these amounting to 5·8 per cent.

TABLE XVII.—*Order of birth.*

[Figures show the frequency of each order in 10,000.]

Order of child in family.	Scotland, all marriages. Census 1911.	Scotland, births, 1855. Lewis.	New South Wales, births, 1893–1900. Coghlan.	Order of child in family.	Scotland, all marriages. Census 1911.	Scotland, births, 1855. Lewis.	New South Wales, births, 1893–1900. Coghlan.
1st	2,153	1,899	2,013	12th	57	51	91
2nd	1,837	1,609	1,651	13th	27	21	48
3rd	1,504	1,535	1,396	14th	13	8	24
4th	1,205	1,274	1,157	15th	5	4	12
5th	949	1,049	961	16th	2	1	5
6th	734	824	781	17th	1	1	2
7th	551	632	626	18th	—	—	1
8th	400	462	483	19th	—	—	—
9th	275	314	348	20th	—	—	—
10th	177	185	243	Unknown	—	25	—
11th	104	106	157				

Dr. Lewis gives a table derived from the same registration statistics giving the frequency of complete sterility among mothers of varying ages, and in Table XVIII I compare his figures with those of this census. Dr. Lewis gets his figures by comparing the marriages of women of specified ages during the year 1855 with the numbers of first births registered during that year. Perhaps his data were not so satisfactory as those got from the census returns, and the very evident differences in Table XVIII may be attributable thereto.

TABLE XVIII.—*Proportion of sterile marriages per cent. of all marriages in Scotland in* 1855 *and* 1911.

Age of wife at marriage.	1855. Lewis.	1911. Census.	Age of wife at marriage.	1855. Lewis.	1911. Census.
20–24	1·51	4·49	30–34	32·30	15·87
25–29	22·47	8·52	35–39	51·10	33·70

I annex a short list of works referred to in preparing this Paper.

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(5) "The decline of the birth-rate, an essay in statistics," T. A. Coghlan, Sydney, 1903.

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DISCUSSION *on* DR. DUNLOP'S PAPER.

MR. T. A. WELTON said that in dealing with the question of birth-rate he himself had adopted a very much more humble method. He had compared simply the number of births with the number of married women under 45. He thought that was the best rough measure that they were able to make use of. In doing that one came to the conclusion that in Scotland there had been a fall of the proportion of the legitimate births to married women as between 27·2 per hundred in 1901 to 23·0 in 1910, viz., more than 10 per cent. decline in ten years. He said he was not in a position to criticise the details of Dr. Dunlop's Paper, but he wished to point out the reasons which induced him to think that a study of this kind for Scotland would be immensely improved if it were sub-divided into three or four parts. The tendency to marry he had elsewhere measured in this way. He had calculated the proportion of bachelors among men of the age of 45 to 55, and he had found it was in England about 10, 11, or 12 per cent.; but the like proportion in Ireland was very high. For the whole of Ireland in 1911 it was 27·3 per cent., in Leinster as high as 30·8, and in England and

Wales in 1911 the proportion was 12·1, which showed that the Irish proportion of bachelors was $2\frac{1}{2}$ times as much as that in England. If they took the Scotch figures, they found that two-thirds of the surface of Scotland, mostly the Highlands and thinly-peopled parts, presented nearly as great a proportion of bachelors as the number they got in Ireland. The average for two-thirds of Scotland was 24·5, and for the other one-third of the surface, much more than a third of the population, it was 14·5. On looking into the matter in greater detail, he was led to think that a study of the facts for the Highland counties, ranging from Caithness to Argyle, for the counties in or near the Tweed valley, and for the colliery counties, ranging from Fifeshire to Ayr, would give results rather different from the average of the whole people. They had plenty of examples in England of the inconvenience of massing together dissimilar elements. He understood from people who resided in Ireland that the reason of the extraordinary number of bachelors was, that a small farmer kept his sons about the home as unpaid labourers, and they did not marry while they were living in the paternal home, though they grew in years considerably; whereas in England, a young man going away to seek his fortune from his parental home was always obliged, if he wanted to have a home at all, to marry at an earlier age, which he thought accounted for the much greater proportion of marriages among young men in England. As regards the fertility of marriages, there was this much to be said, that the proportion in Scotland was much higher in the Highland districts, where marriages were few, than it was in the other districts, where marriages were comparatively more numerous. In the Tweed valley they had Berwick with 19·7 per 100 married women aged less than 45, in Peebles 18·8, in Roxburgh 17·9, Selkirk 16·1; but in Caithness 27, Ross 27, Sutherland 25, Inverness 24, and Argyle 24—really a much higher proportion of births, compared with the number of mothers in the Highland districts, than in the Tweed neighbourhood. The only exception to the rule was in Linlithgow, where there was also a high proportion of births to mothers, which he associated with the same reasons that made the birth rates in Glamorgan and in Durham considerably above the average. In colliery districts the birth-rate was generally found to be governed by social conditions different from what one met with in an agricultural country. On the whole he therefore thought it would be an advantage if they could have figures like those for three or four sections of Scotland, illustrating the habits and character of the people. As regards the question of occupational statistics, he hoped the Society would bear in mind that a man might change his occupation. For instance, the miners in Northumberland very often, after reaching a certain age, turned from the occupation of mining to the cultivation of a patch of land, and spent their old age as small occupiers. Of course, if they were dealing with statistics, whether of fertility or any other subject, they had to consider these changes, which altogether altered the early history of a former collier who to-day was a cottager, and which had a good deal to do with his prospects in life and everything else affecting him. He hoped he had not fatigued the Society with these points of distinction; but he really felt that as it would be a mistake to mass the Irish and English figures together, so it was a pity to merge the whole of the Scottish figures in one mass, when very likely quite different results would be had by taking the population of the Lowlands and the population of the Highlands separately.

Dr. GREENWOOD, in seconding the vote of thanks, said the Paper was indeed of great interest from two points of view—that of the statistical specialist and that of the statesman. He said he would first refer to one or two theoretical points. In the first place, it was of great interest to see an application in official statistics of the theory of skew correlation. He was personally interested in that point, because in a Paper, by his colleagues Mrs. Wood and Mr. Brown and himself, which would appear in a forthcoming issue of the *Journal*, they had occasion to refer to this method; and he concluded from the equation given on p. 269 that Mr. Rae had approached the problem by the same route as that they had followed. It appeared to them that the proper way to obtain an equation, when the regression surface was definitely "non-planar," was simply to extend the analysis given in Professor Pearson's classical memoir on Skew Correlation to the case of three variables. In that case, one necessarily obtained a regression equation which involved a term in x^2, a term in y^2 and a term in xy, as well as terms in x and in y. That was the form of the equation Mr. Rae had obtained. In this connection he congratulated Mr. Rae on his success in facing the heroic amount of arithmetic which the application must have involved and before which they had quailed. Further, in that connection, he said it would be very interesting to know whether Mr. Rae's analysis had led him to the discovery of any single constant which would be comparable in the case of multiple skew correlation with the partial coefficient of correlation, in the ordinary case, because in so many problems what was required to be known was simply the measure of the association between A and B which was independent of their common association with C; in ordinary regression they had the partial coefficient of correlation which was not applicable in the case of skew regression. He (Dr. Greenwood) and his colleagues had not succeeded in obtaining anything in the nature of a true partial correlation ratio comparable with the coefficient of partial correlation, but it was possible Mr. Rae had succeeded better. A second theoretical point which arose was, as to how far the probable errors deduced from the formula on p. 274 were real measures of reliability. The method assumed a normal distribution of the differences of sample-means. It was quite well known that even in the case of a normal population, the means of *small* samples were not strictly normally distributed,* and in the case even of fairly large samples (25, 50 or 100) taken from very skew populations, it had been shown* that the distribution of means was sufficiently skew to render the calculation of errors with the help of a normal curve inappropriate. He said, the particular distribution under notice, that of fertility, was decidedly skew, and hence he should doubt whether the notation of probable errors were appropriate, and he thought Mr. Yule's plan of leaving the standard deviations unconverted would have been preferable. Such a course would put the reader on his guard. Perhaps the probable error nomenclature should not be applied in that case. Passing to the extremely interesting practical results, there was one point which rather blended practice with theory; and he would be interested to know whether it had been followed up in the Census Office—that was raised by "The distribution of the number of children to marriages in which the fertile period is complete," on p. 263. They would notice that that frequency distribution was of a peculiar character: there were two peaks, and obviously one would not expect a curve of frequency, such, for exampl , as one of Professor Pearson's family of curves, to fit the distribution. The question suggested itself as to whether the first group (that of zero family) in particular were not heterogeneous. Evidently artificial limitation of fertility complicated the problem, and it would be rather an interesting thing to enquire whether it might be possible to resolve the distribution into homogeneous components. There were, further, two practical points which seemed to him of considerable interest; first, as to how far there was excessive infant mortality in families of working mothers, and as to whether the comparison actually made had any great value in this connection. Perhaps he was misinterpreting the sampling method used, but it seemed to him the things compared were not *in pari materia* at all. No one, he imagined, had ever doubted that the infant mortality in the working classes was very much higher than the infant mortality, for instance, among the Peerage; and surely to have a valid method of determining the influence on infant mortality of the employment of the mother, one must compare the families of occupied mothers with the families of unoccupied mothers in the same social stratum; as it appeared to him the sample comprising the occupied mothers would include persons almost entirely in one social stratum, whereas the controlled sample would include mothers from various other occupations and social classes, and consequently the comparison seemed to him to be invalid. It might be that he had misinterpreted the method actually used. With regard to the occupational fertilities, he took it that the differences in the fertility of those groups evidently depended upon a complex of causes. For example, one would naturally expect that those occupations in which residence together of husband and wife was liable frequently to be interrupted would exhibit low fertility. For example, taking the group of soldiers, non-commissioned officers, men of the navy and marine, and army officers, one would expect, apart from any question of artificial limitation or physiological difference, that it would be fairly low in the scale. Consequently in using the results to determine any question as to the distribution of artificial methods of limitation or of physiological fertility, such occupations he thought must be excluded. There was a very large number of points which arose, and no doubt that which Mr. Welton had raised in opening the discussion as to regional distribution was one which Dr. Dunlop had considered, but, he took it, could not bring within the limits of the Paper. It would probably be within the recollection of many Fellows of the Society that Dr. Brownlee* had drawn attention to the fact that the declining fertility as measured by corrected birth-rates in different parts of Scotland had been, at from the time he wrote, so distributed as to suggest that the importance of artificial methods of limitation as a cause had been exaggerated. The fertility statistics of Scotland by districts would throw considerable light on this problem.

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* *Biometrika*, vi, 1.

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* *Biometrika*, vii, 5?5 and 531.

Mr. DE JASTRZEBSKI said that although he could not claim to be an expert, he was extremely conscious of the enormous difficulties which attended the preparation of fertility tables, especially when undertaken for the first time. The field was so complex, the results at which one could aim so varied, that it must in the end come to a question of selection as to what one should attempt to do. He therefore asked Dr. Dunlop to take his criticisms as being qualified and modified very largely by that consideration. Turning to p. 268 of the Paper one sentence read as follows : " From the multiple " correlation formula it may be gathered that a delay of three years " on the part of the wife reduces the average size of the family " approximately by one child, and that it requires a delay of something like forty years on the part of the husband to effect the same " reduction." Not being a higher mathematician, he was not at all certain whether he understood what that meant ; but to a non-mathematical mind it should mean what it said, that was, that a delay of forty years in the case of a married man would produce the same effect on the size of the family as a delay of three years on the part of the woman. He turned to Table VI, on p. 270, to find some confirmation from the predicted fertility of marriage for selected ages of wife and husband, and if they took the case of equal ages, say 20, there were 8·09 children ; if the age of the husband were 50, it had come down 5 children, instead of $\frac{3}{4}$ of a child. Then again, the formula at the end of Table VII for tabulating the effect of varying ages did not agree with Table VI or with the statement, and the point that struck him was that if the result of the application of higher mathematics to data of that sort were to produce three entirely varying results to the poor layman like himself, surely statistics were sufficiently of a morass to most of them to begin with, without making it a Serbonian bog in which they floundered hopelessly. It was just as well that they should bear in mind that Dr. Dunlop had told them durations were probably the least satisfactory part of anything one could do in the matter of marriage fertility in this country. The moment one took duration by individual years, the whole of the statistics would be hopelessly at sea, for the simple reason that the Census Schedule only told them that the marriage was either less than one year or more than one year, and so on. It never accounted for the periods in between, and he took it the figure given—that of 100,000 marriages at the end of the first year in Scotland only 26,700 were fertile—was based on the fallacy that all the marriages of less than one year's duration had been taken and counted as being of one year's duration. In matters of that sort there was a decided interest on the part of the person filling up the Census Schedule to give erroneous particulars. It was quite obvious if they had to fill up a Census Schedule and put down one child at the age of 7 months, it would be very awkward to return the marriage as being under one year. He did not wish to convict his brethren from the north side of the Tweed as being more prone to deviate from the paths of strict veracity than those who lived on this side of it, but he had found that at the time of the Census in Scotland there were 31,307 marriages of under one year's duration, and allowing for the elimination of doubtfuls and those cases where the husband and wife were not enumerated together, there should have been at least 30,000 marriages of under one year's duration in these Census Schedules; as a matter of fact there were only 16,755. He did not know what had become of the other 13,000, but he could guess pretty shrewdly where they had gone. The consequence was that the first figure must be taken not only with a grain, but with a liberal bucket of salt. He was glad to learn that there was no such thing as pre-nuptial conception. Far from that, only about 25 per cent. of Scotch wives conceived during the first three months of their marriage. That disagreed entirely with the experience of other countries where actual data had been obtained. The first year in these returns meant marriages from 0 up to 12 months. The second was an average of only 18 months and not of 2 years, and all the way through they would find the same fallacy at work. It therefore seemed to him in calculating from a Census Return it would be better to group the years together into small groups rather than endeavour to draw up tables on individual years. He did not for a moment advocate asking people to put the date of their marriage on the Census Schedule, for when one asked for duration at all one gave a strong inducement to people to avoid the exact figures; but if one asked them to put the date of marriage on the Census Schedule one offered a stronger inducement still. Körösi's was, as far as he knew, almost the only attempt to find the fall in the procreative faculty in man, and if it had to be made at all, it seemed to him the attempt must be made with wives of fixed age, and not on the whole of the wives of varying ages. Körösi took wives of fixed age, and found a drop in fertility of 22½ per cent., with an increase of 10 years in the average age of husbands, and that with the increase of 20 years in the age of the husband, the drop was 44 per cent. Finally, on the question of the occupational fertility there was a particularly interesting table relating to the relative fertility and infant mortality of working mothers. It was a question which was of great interest at the present time. Unfortunately the figures were rather small, and the only group of working women which was of any size was the textile group, where they got 2,164 marriages with 6,113 children. Of those children 27 per cent. were dead, while of the mothers not working the proportion dead was 14·8. So that the infant mortality in that group was nearly double where the mothers were at work; but the fertility of the mothers who were at work was higher than that of the mothers who were not at work. If they worked it out they would see there were 2·82 children per marriage in the textile group, whereas in the whole group of mothers not working it was only 2·56. One knew that there was an intimate relation between a high rate of infantile mortality and a high birth-rate. But if they went on to the effective fertility, that was the number of children surviving, they would find in the group of women working it was only 2·06, as against 2·19 in non-working women. That brought him to his one serious criticism on the tables, which was that he did not see why the question of the number of dead children had been left out of every one of them, although the Census material was there for them. Effective fertility was quite as important a subject of study as fertility merely calculated on the number of children born. It was far more important for the State that a woman should bear six children and rear five than that she should utter the cry of the Lancashire woman, "I have buried eight." If we had the data of the number of children deceased it would undoubtedly be of very great assistance in getting at some facts on that point.

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* "Germinal Vitality," by J. Brownlee, M.D., D.Sc., *Proc. Roy. Philos. Soc.*, Glasgow, April, 1908.

Dr. Snow suggested a possible alternative partial explanation of the figures discussed in the section headed *Declining National Fertility*, and given in Tables XI, XII and XIV. These figures referred to the families of those surviving in 1911 who were married at various periods—before 1861, 1861–69, etc. If it could be demonstrated that the mortality of parents with large families after the period when the family was completed was less than that of parents with small families, it would follow that the small families derived from early marriages were not represented in the proper proportion among the surviving parents in 1911. If this were true the figures stated exaggerated the fertility of the marriages occurring before 1880, in comparison with that of the later ones. Some evidence that such differential mortality is operative was published fourteen years ago,* and he believed, therefore, that the method adopted was not altogether a satisfactory one for demonstrating the decline in fertility. Indeed, seeing that the average size of family from marriages of 1866–70 appeared to be smaller than that for marriages of 1861–65, both for Scotland and for New South Wales, while the birth-rate did not fall appreciably in those countries until 1881–91, he was prepared to accept the figures given for marriages before 1870 as *evidence* of the higher mortality of the parents with small families. Although the sample dealt with included as many as 90 per cent. of the total number of marriages, he thought it important to examine the method of selection of the sample to see if it were truly representative of the total population and also if the results from it could be used for comparison with those from other countries. If, for instance, the 10 per cent. omitted included an excessive proportion of large families, the average family stated would be below the true figure. In the first place, cases in which the family was not stated were necessarily left out. Was there any tendency for these to belong to large families rather than to small ones. Figures from Australia showed that the size of family was left unstated proportionally more by old parents than by young, and therefore probably more by parents of large families than by those of small ones. If this were true of Scotland, the average stated would be slightly below the true figure. In the second place, although it was probably an advantage to omit cases in which the wife was over 45 at time of marriage, this had not been done in the returns from Australia and New Zealand, and the comparison of the figures for Scotland with those for the other countries was affected. Such marriages, however, were but 1 per cent. of the total, and the discrepancy introduced was probably negligible. It was interesting to note that the number of sterile marriages in Australia was only 8·2 per cent., compared with 11·5 per cent. in Scotland. He was satisfied that the 90 per cent. of marriages dealt with gave results practically identical with those which would have been reached had the whole 100 per cent. been available.

Sir JAMES PATTEN MACDOUGALL said he was very glad to have been there and heard the observations which had been made upon their statistics. He confessed he was not a higher mathematician. Dr. Dunlop was at the head of the statistical branch of the Registrar-General's Department in Scotland, and he deserved all the credit for the report which he had produced. He was satisfied it was a report which would create a very large amount of interest, and he was satisfied the statistical branch of the Department in Scotland had devoted a large amount of time, skill and attention to the work. Whether the statistics were of very much importance practically was another matter. He did not know whether, when the time came for another Census, the country and Parliament would feel that the addition of the fertility column in the Census Schedule of 1911 had been justified to the extent that they hoped. He trusted that it would be so, because although they might not be of much practical advantage he was sure they were of very considerable interest to the country at large, in view of the undoubted fact, common to this country and to many others, that the birth-rate was sensibly diminishing year by year.

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* See Beeton, Yule and Pearson "On the correlation between duration of life and the number of offspring." *Proceedings, Royal Society*, vol. 67 (1900), p. 159. The material used in this investigation was derived from genealogical records. The same conclusion, however, can be derived from the vital statistics of a whole nation, but it is not possible to give here a short summary of the results.—[E.C.S.].

Mr. YULE desired to join in the expression of thanks to Dr. Dunlop. With regard to the paragraph at the bottom of p. 268, he enquired whether the effects broadly attributed to duration of marriage were not in fact partly the effect of the age of the wife at marriage. He understood that the figures were based upon wives of all ages under 45 at Census. The longer durations in that case would consequently surely mean that the wives were younger at marriage, while the shorter duration would refer to wives of more varied ages at marriage, and consequently on the average rather older. The resulting figures were consequently a complicated function both of duration and of age of wife at marriage, and that would account for the rather paradoxical result that was mentioned in the paragraph.

Dr. DUNLOP agreed.

Mr. YULE then said, as regards the data for occupational groups, that although it appeared fairly clearly that the age of husbands at marriage was of quite minor importance, nevertheless it was of some effect, and would tend to diminish the differences between the professional classes and the labouring classes, given on p. 275, because the husbands in the professional group would probably be older than the husbands in the case of the artisan classes. If then the ages of the husbands were equalised in the two groups, the fertility of the professional group would be thrown up slightly. He also said he hoped public notice would be taken of the average size of families of ministers and clergymen, as shown in the table on p. 277. Married people in this country of late years had been preached at somewhat frequently by clergymen, and he hoped that they would note that the average size of their own families was much the same as the average of the families of persons in the same social class. He wished that Mr. Rae had been present so that he might have been personally congratulated on his interesting work on the regression equations, and also that one or two questions could have been put to him on some points of the work. Comparing the two equations at the foot of p. 270, for example, he had noticed that the first equation for the case of marriages of "completed fertility" included a product term for ages of wife and husband, while the second equation for marriages of incompleted fertility, taking duration also into account, did not include any product term, and he would like to enquire the reason.

The President said that he agreed with Dr. Greenwood and others in their praise of Dr. Dunlop's Paper. He hardly knew whether more to admire the practical or the theoretical part of the work—the edifice with its numerous compartments, as it were, built up into space of many dimensions, or the methods of construction which were applicable to other sites in other regions of statistics. It was a peculiarity of such structures that the edifice was in a sense stronger than the foundation. Not that anything weighty was based upon nothing; but that the entire weight of the edifice did not rest on the ground immediately underneath—the basis of specific experience. A collateral support was obtained from a sort of buttress or cross-bar, which rested indeed on a basis of experience, but on one that was not quite adjacent. It was thus that the actuary when constructing a life-table for a particular—perhaps not very large—population brought to bear on the irregularities of the data the general knowledge that mortality in the aggregate varied continuously from year to year. Even the uncertainty of female ages was not fatal to the construction of life-tables. The sort of advantage obtained by thus smoothing the data was presented by the formulæ for correlation which Dr. Dunlop had adduced. There might also be claimed for the formulæ connecting age and fertility the more familiar advantage of deductive reasoning; to bring out in an available form what is implicit in the data. He could wish that these advantages were purchaseable at a less cost of labour. He looked with alarm on the determination of constants involving products of the fourth power of one variable with the first power of another. There had been suggested a method of representing correlation which would not require so many constants, such high powers and such laborious calculations. The method consisted in determining a normal (not in general symmetrical) surface (more generally hyper-surface); and so projecting it as to make it approximately coincident with the given skew shape. He thought that some of the experiments recorded by Professor Pearson in a recent paper (on Theories of Association) countenanced the presumption that this method of *translation* might be safely applied to a large class of skew frequency-surfaces.

Dr. Dunlop, in reply, expressed his grateful thanks not only for the reception that had been given to him, but also for the opportunity of bringing the Paper before them. He said that Mr. Welton, who had passed a very friendly criticism on the Paper, had suggested that some work might have been done on the study of local fertilities, by making comparisons between those of the larger divisions of Scotland. He thought that a perfectly good suggestion. But it, along with many other conceptions, had been fully considered before the main tabulation was started, and it, along with others, was dropped because it was considered to be better to concentrate on the one big issue—the fertility of marriage in general—rather than attempt any over complication. The main tabulation was very elaborate and very lengthy, and a repetition of it, even for a few divisions of the country, was hardly possible. Mr. Welton also made reference to the expression of birth-rates per 1,000 women of child-bearing age; this, for some years past, has been done in the reports of the Registrar-General for Scotland. He specially thanked Dr. Greenwood for his appreciation of the statistical methods used, and he was sure that Mr. Rae would be greatly flattered and pleased to hear such appreciation of his work. Dr. Greenwood had asked whether Mr. Rae had found a way of expressing partial correlations from skew regressions; the answer was in the negative, and hence the use of the partial correlations derived from linear regressions in the Paper. Dr. Greenwood had also suggested that it would have been better to use standard deviations rather than probable errors in the table of occupational fertilities; that might be so, but, after all, those preferring standard deviations could readily obtain them by dividing the probable errors by 0·6745, which was the multiplying factor used for the conversion of the standard deviations into the probable errors. Dr. Greenwood had also made some interesting remarks on the distribution in Table I, drawing attention to the existence of two maxima, the one being for sterile marriages, and the other for a six-child family, and from that arguing that sterility was a complex quantity. Doubtless that was the case. It might be due to some inherent defect on the part of the woman, or to disease of the woman, or it might be due to bad health of the man, or indeed to many other causes. An expression of opinion as to the cause was outside the scope of the Paper. The method of sampling used in the study of the effect of the mother's occupation on the life of the children was questioned, and it was suggested that a full tabulation of all marriages would have been preferable. Dr. Dunlop pointed out how that the facts regarding working mothers were too few to justify such a course, and argued from the fact that the samples showed very similar numbers of children, that they were fairly made and satisfactory. Mr. de Jastrzebski's criticisms had interested him very much. Dr. Snow has promised to explain to Mr. Jastrzebski the significance of partial correlations. The question of the significance of the numbers reported as married for less than one year was difficult to answer. A scrutiny of the numbers given in the Census Report (Table XXVII) showed that marriages of duration of more than one but less than two years numbered, approximately, 27,000, while those of less than one year only numbered, approximately, 17,000, a comparison suggesting a transference of something like half the marriages of the 0 to 1 duration to the 1 to 2 duration. But the fact that duration 1 to 2 was not overburdened but had a number of marriages only slightly different from those of durations 2 to 3, 3 to 4 and 4 to 5, indicated that the transference of marriages to duration 1 to 2 from duration 0 to 1 was balanced by a similar transference from duration 1 to 2 to duration 2 to 3, and also indicated compensating transferences to and from the subsequent durations. But further there was no distinct indication that the marriages transferred from the shorter to the longer durations were those of the latter half, or of any special part, of the shorter duration, and consequently no endeavour was made to allow for this evident imperfection of observation, it being considered better to deal with each duration as a fair sample rather than adjust for an imperfectly understood quantity. Dr. Snow had drawn attention to an interesting point in connection with the observed decline of fertility, viz., that it was conceivable that the apparent high fertilities of the earlier marriages might be associated with the fact that the marriages of the earlier years tabulated were those of the healthiest parents, and such parents might have produced families larger than the average. He (Dr. Dunlop) pointed out that while the theory might be feasible it was probably insufficient to explain the entire drop. Dr. Snow referred to the exclusion of marriages of which the size of the family was not stated. That was not done, such marriages being treated as childless. The marriages excluded on the ground of confusion were those in which there was evident error, as, for instance, cases of women marrying at ages over 40 being reported as mothers of seven or eight children, the probable explanation being the inclusions of children of first marriages. With regard to the use of the age 45 as the limit of the fertile period Dr. Dunlop pointed out that he was quite aware that it might be questioned, but he claimed that it was a good working limit, childbirth after that age being more abnormal than normal.

The following Candidates were elected Fellows of the Society:—

Archibald Brown.
Hubert Greenwell.
Augustus Kahn, M.A.
J. A. Robertson.
H. E. Soper.

On the Use of Analytical Geometry to Represent Certain Kinds of Statistics.

By Professor F. Y. Edgeworth, M.A., F.B.A.

This paper is designed as an addendum to the similarly entitled paper which I contributed to the Congress of Mathematicians in 1912.[*] The two papers form a sequel to the series of articles in this *Journal*, beginning December, 1898, in which I discussed the *Mathematical Representation of Statistics*.[†] The object then aimed at has not lost its importance by the lapse of time. Rather, with the progress of biometric science, more attention is now devoted to records of the frequency with which members of a class present different sizes of any organ or attribute. It is required now more than ever to represent such *frequency-statistics* by analytic geometry through the use of a shape defined by an equation. It is felt that such a formula is indispensable for enquiries such as that which was initiated by Weldon when he ascertained that the frequency-distribution of a certain feature in crabs (of a certain species) varies under the action of a cause unfavourable to individuals in which the feature is large. Without the aid of the Pearsonian—or some equivalent—representative formula, Weldon could not so well have detected a variation which seems calculated to throw light on the mysteries of evolution.

Unversed as I am in the subject-matter of biology I cannot adequately exhibit the advantage which the science derives from mathematical apparatus. But I can discern that when reasoning is based on the grouping or distribution of observations, it must be an aid to thought to apprehend and distinguish different sorts of grouping by means of a mathematical formula. To this recent employment of analysis is to be added its older use in the construction of mortality-tables. The definite curves employed by actuaries for that purpose seem not likely to be superseded by mere graphs not defined by an equation. Without attempting to enumerate all the actual and possible uses of the proposed task, enough has been said to show that the work is serious; that it is worth doing, and accordingly worth doing well.

How are we to define "doing well" in this matter? This is a question which I endeavoured to answer at the outset of the earlier discussions.[‡] I need not repeat that the fit of the sought formula to the given observations should be as close, and the arithmetical labour involved as light, as may be possible consistently with other requirements. I shall dwell now only on the less obvious conditions.

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[*] Published in the "Proceedings of the Congress," hereinafter referred to as "Congress Paper."

[†] *Journal of the Royal Statistical Society* (hereinafter referred to as *J.R.S.S.*), December, 1898 to March, 1900.

[‡] *J.R.S.S.*, vol. LXI (1898), p. 671.

There is, first, the fulfilment of some particular practical purpose. Thus the formula commonly adopted by actuaries to represent the number of deaths at each age of a population, the Gompertz-Makeham law, has the singular advantage of lending itself to the ready calculation of annuities on joint lives. As Mr. Hardy observes, "For practical purposes, owing to the great convenience attaching to the use of the formula, it is worth while to stretch a point in its favour."* Can it be that there is any practical convenience of this special kind to be aimed at in the problem now before us, dealing as it does with all kinds of biological and vital statistics and indeed with frequency-statistics in general? I submit that there is such an object. Supposing that the constants of the required representative formula have been determined; it is a practical advantage to be able to pass with facility from the constants to the typical arrangement which they designate, the *percentiles* of the constructed or hypothetical distribution. This advantage is afforded by the method which is to be here proposed, and may incline statisticians to "stretch a point in its favour."

Another criterion is the suitability of the sought formula to represent the manifestations of some known cause or probable hypothesis.† A regulative idea of this sort is present in the problem before us so far as the statistics under consideration admit of being treated as "chance distributions."‡ In so far as the action of independent causes—the essential attribute of chance, I hold—may be presumed there is to be expected some affinity to the law which results from that action, the ubiquitous law of error. I do not mean that the law must be fulfilled in that perfection which deserves the epithet "normal." I do not even postulate that degree of approximation to normality which I have attributed to the "generalised law of error."§ I assume only that an approach to that form has begun, or that digression therefrom has not ended in complete degradation. As Mr. Elderton says of the "binomial"—which in the limit, when the number of observations is indefinitely increased, becomes identical with the normal law—"it is natural to start from it and it is doubtless right to treat it or its limit as a part of any system." || I start from the normal law of error, and I do not travel so far from it but that something of its familiar outline and contour

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* *Construction of Tables of Mortality*, p. 71.

† *Cp.* Karl Pearson, "On the Systematic Fitting of Curves," *Biometrika*, Vol. I, p. 266 (*Introductory Note*). It is well said and shown there that "half the difficulty of curve-fitting in practice lies in the choice of a suitable curve."

‡ "Statistics which may reasonably be described as chance-distributions," as Mr. Palin Elderton has it in the paper read before the Fourth Congress of Mathematicians dealing with "curves used for graduating chance-distributions."

§ *J.R.S.S.*, 1906.

|| *Loc. cit.*, p. 233.

remains visible.[*] I deal only with frequency-curves which have a single maximum[†] and trend to zero at both extremities. U-shaped curves and other extremely abnormal shapes are ruled out.

Another somewhat indefinite quality, mathematical neatness, forms an additional criterion. This desideratum is often at variance with other conditions. For example, the simple law proposed by Gompertz to represent the frequency of deaths at different ages is neater than the formula elaborated by Makeham. But the latter form is adapted to a wider range of experience. In the application of this criterion there is room for considerable differences of taste. For example, how should we appraise the construction of a frequency-curve connecting, not the size of a feature with the frequency of its occurrence, but the logarithm of that magnitude with the logarithm of such frequency? And is there not a marked difference between the formulæ of this kind according as the two logarithms are connected by a *linear* equation, as in M. Pareto's celebrated income-curve, and a formula such as $\log. y = 6{\cdot}759\ .\ .\ .\ .\ - - {\cdot}038\ .\ .\ .\ (\log. x)^3$; where x denotes the magnitude of an observation, y the frequency of its occurrence? (*Cp.* Benini, *Principii di Statistica*, p. 185, and context). Again, is it an elegance in the Pearsonian system that its fundamental formula, the unity which holds together the plurality of cases, is not an integral form adapted by the variations of its constants to the variety of cases, but a *differential* equation, the variation of whose constants corresponds to quite distinct integral forms?

I do not attempt to pronounce on these questions of expediency and taste. I only submit that statisticians would do well to come to an agreement as to the method of representation which is best in general, or with reference to particular purposes. The labour of practitioners would be economised, and their results would be more valuable because more comparable. The sort of competitive examination which I desiderate has been commenced by Mr. Palin Elderton in the paper which he communicated to the Fourth Congress of Mathematicians (at Rome). But he has not examined all the competitors, in particular the method here set forth, which was introduced under the designation of the *Method of Translation* in this *Journal*.[‡] True he had not before him a clear statement of the method at the time of his writing. The method of translation, as introduced in this *Journal*, was not sufficiently distinguished from the subsequently developed "generalised law of error"; or at least the separate existence of the former was not justified. When the constants by which the "translation" is effected are very small, there is no material difference between the two procedures. But when, as now contemplated, these constants (though not very large) are large enough to infringe the generalised law, there is this material difference that then the *a priori* ground for the preference of the proposed formula breaks down. The advantage over the Pearsonian construction in respect of *rationale* claimed justly for the generalised law cannot be attributed to translation in general. Rather the general method which is to be set forth here is recommended by a rationale as good as, but not any better than, that which has satisfied Professor Pearson. Whether it is easier with him to diverge from the normal curve by substituting in the variable with its parameter, say $\frac{x}{b}$, occurring in the normal error-function, for b the quadratic expression $b_0 + b_1x + b_2x^2$;* or with us to substitute for the *reciprocal* of b, say a, the quadratic expression $a_0 + a_1x + a_2x^2$ (or what comes to the same, to suppose the parameter b *divided* by a quadratic such as $1 + \kappa x + \lambda x^2$).

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[*] On the nature of the assumptions made compare *J.R.S.S.*, vol. LXXVI (1912-13), p. 182.

[†] *Cp. Congress Paper*, p. 1 (p. 1 of the Paper itself, p. 427, vol. II, of the *Proceedings of the Fifth International Congress of Mathematicians*).

[‡] *J.R.S.S.*, 1899 (above cited).

In the present paper we shall mostly use the translating operator in the form $a(1 + \kappa x + \lambda x^2)$. When this expression, multiplied by x, is substituted for x, the abscissa of a normal error-curve with unit modulus (or *mutatis mutandis* unit *standard-deviation*), there results a curve which, it is claimed, is apt to represent a great variety of frequency statistics.

The method may be compared with others with respect to two kinds of data, associated respectively with the names of Galton and Pearson, *percentiles* and *moments*. It seems to be generally accepted that the latter sort of data when available are preferable. I do not dispute this preference ; but I am not sure that it is rested on the right grounds. Perhaps too much weight is assigned to the circumstance that moments utilise all the given statistics. But the fact that the result is an average which is an explicit function of all the given items does not necessarily constitute an advantage over an average which, though not a *function* of the given items, is yet obtained by a process which utilises them all. For example, let us compare in respect of accuracy the use of precentiles and the use of moments to determine the standard deviation of a normal error-curve representative of a given set of statistics. Let the percentiles used be the pair specially recommended by Mr. Sheppard,† the points whose distance from the centre (which may be supposed given) is ·862 of the standard deviation. Let the moments be the *sixth* mean power measured from the given centre. Well, the probable error incident to the use of percentiles, as found by Mr. Sheppard, is $\frac{\cdot 5905}{\sqrt{n}}$‡ where n is the number of observations ; that is the relative probable error, such that the result is as likely as not to diverge from the true magnitude by $59 \cdot 05/\sqrt{n}$ per cent. (of that magnitude). The percentage probable error incident to the moments, as found by Gauss,[*] is $75 \cdot 77/\sqrt{n}$; larger than the error of the percentiles! If we had utilised the mean *fifth* power of the observations (measured in absolute quantity on the negative side of the centre) the advantage in respect of accuracy would still be on the side of the *percentiles*.[†] The mean *fourth* power indeed shows a slight advantage on the side of the *moments*, but an advantage which would probably disappear if we utilised several, not merely a pair, of percentiles, after the manner explained in the sequel.

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* See Pearson, "Mathematical Contribution" No. XIV (*Drapers' Biological Series*), p. 5, and *Biometrika* Vol. IV, pp. 179, 210, &c. *Cp. Congress Paper*, p. 12.

† *Transactions of the Royal Society*, 1898, p. 135.

‡ *Loc. cit.*

These propositions may seem at variance with Mr. Sheppard's demonstration that moments are more accurate than percentiles. But his theory relates to the mean *second* power only, not to mean powers in general. Now the mean second power stands on a quite different footing from the other mean powers with reference to the normal error-curve, in that it constitutes that function of the observation which is given *a priori* by Inverse Probabilities as the most probable value of the sought constant.[‡] As far as a constant may claim affinity to the modulus (or standard deviation) of a normal error-curve, so far there is a presumption in favour of a mean power, but not further. Now, as our constant a (in the last written expression) is akin to such a modulus, in fact becomes the inverse modulus of the generated curve in the limit when the two other constants become zero; it is tenable that the best determination of the three constants would be a combination of the second moment with a sufficient number of percentiles.

However, I am not concerned to magnify the efficacy of percentiles. I admit that they are apt to be deficient in a quality which I did not sufficiently take account of when postulating arithmetical facility, namely, what a high authority has called "straightforwardness." Professor Turner found the method of percentiles which I long ago proposed for reducing observations relating to two or more *quæsita*, somewhat deficient in this quality.[§] He concludes: "There would, I imagine, never be quite the same "straightforwardness about the new method which makes the method "of least squares so easy, although somewhat long."[‖] So far as moments are preferable, a point is scored by the Pearsonian method which passes with peculiar facility from the given moments to the sought constants.[¶] The utilisation of moments is not effected so felicitously by our method; still it is effected, as I show in the first section following. Where percentiles and the method of translation come in is where moments are not available. Sometimes the extremities of the frequency-group are not given, or not given in sufficient detail. Sometimes the given statistics are not *homogeneous*. There may be a little hump at either extremity or both, owing to the presence of a sub-class such as giants or dwarfs in the case of human heights. Or, even though the postulate of unimodality is not thus violated, it may be that a formula which would fit the great part of the group very well is quite unsuited to the extremities. Where such imperfections are known or may be suspected to affect the data it is evidently desirable to replace, or at least to supplement, the use of moments by that of percentiles.*

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[*] Quoted by Czuber, *Beobachtungsfehler*, p. 135.

[†] Czuber, *loc. cit.*

[‡] *Cp. J.R.S.S.*, vol. LXXI (1908), p. 388 *et seq.*

[§] The method which Professor Bowley has illustrated in this *Journal*, vol. LXV (1902), p. 340.

[‖] "On Mr. Edgeworth's method of reducing observations relating to several quantities." *Philosophical Magazine*, vol. XXIV (1887), p. 470.

[¶] *Cp. Congress Paper*, p. 14.

The determination of the translation-constants by way of percentiles includes the particular case when the constants are so small that the generated curve is virtually the "generalised" error-curve. This case arises when a given group is presumed to result from the random action of causes so deficient in number and independence that the generalised law is fulfilled only by a central portion of the group, the "tails" being chaotic.† In such a case it is proper to fit a generalised curve to the central tract; neglecting the remainder except for the purpose of ascertaining percentiles in the central tract. With reference to this particular problem, it is justly objected by Mr. Palin Elderton, in the judicial paper to which I have already referred, that the use of moments necessitates "the reproduction of the exact number of observations"‡—meaning, as I understand, not merely the total contents of the tail, but the size of each section thereof—in short, the complete histogram (in Professor Pearson's phrase). "The method" (of finding the generalised error-curve), says Mr. Elderton justly, "can "hardly be considered satisfactory as a general formula until some "method of overcoming the difficulty mentioned has been found."§ A method of overcoming the difficulty may be found in the *second* section of this paper.

In the *third* section I apply the principle of translation to abnormally skew *surfaces*, not without reference to the much debated theory of correlation.

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* The elaborate "method of determining theoretically at least the constants "of a truncated normal distribution" invented by Professor Pearson (*Biometrika*, vol. VI, p. 63) could not be made available, so far as I can see, to determine the constants proper to his Types for a truncated frequency-group. It is perhaps conceivable that the method might be so extended as to furnish a new way of calculating the constants proper to *translation* for such groups.

† *Cp. J.R.S.S.*, vol. LXIX (1906), p. 512.

‡ *Loc. cit.*, p. 242.

§ The contrary statement made by me in the discussion reported *J.R.S.S.*, vol. LXIX (1906), p. 538 was ill-considered. For without utilising all the data, how can we calculate the position of the Arithmetic Mean on which the whole calculation of moments depends?

SECTION I.—*The Method of Moments.*

In the problem which is the subject of this section the data utilised are the mean powers of the given statistics. Only the first four powers are utilised, for reasons pointed out by Professor Pearson with respect to his system.* The observations from which these means are obtained may primarily be measured from any origin; for instance, length of life (number of years lived) from birth, or the age of 20, or any other appropriate or arbitrary epoch. The set of constants there given is replaced by another quartette, of which the first is still the position of the arithmetic mean of the observations. But the other mean powers are now reckoned from the arithmetic mean as origin: the *moments* which Professor Pearson has made familiar to statisticians under the designations μ_2, μ_3, μ_4. The last two constants are not employed here explicitly, but only as raw material to be worked up (along with μ_2) into two derived constants, namely, in Professor Pearson's notation, $\beta_1 = \mu_3^2/\mu_2^3$. $\beta_2 = \mu_4/\mu_2^2$† or, rather, $\beta_2 - 3$, denoted by η. Instead of β and η it will generally be convenient here to employ the smaller coefficients $\beta_1/8$, say β, and $\eta/12$, say ϵ.

As there are four data so there are four *quæsita*, namely, the Median of the constructed curve—its distance, say M, from any assigned origin; and the three constants which enter into the operator $a(1 + \kappa\xi + \lambda\xi^2)$. The use of this operator, as above intimated, is to operate upon the abscissa of a normal error-curve with unit parameter, by substituting for ξ

$$X = \xi \times a\,(1 + \kappa\xi + \lambda\xi^2).$$

By this operation each little column of the generating normal curve standing on the indefinitely small base $\Delta\xi$ is shifted or "translated" to a new distance from the Median with a new base ΔX. The new base may be written

$$\Delta X = \frac{dX}{d\xi}\Delta\xi = a(1 + 2\kappa\xi + 3\lambda\xi^2)\Delta\xi.$$

It should be observed that the constants of the operator will be affected by the unit in terms of which the abscissæ of the generating curve are measured. The parameter which satisfied the classical writers on Probabilities, the *modulus*, is here principally employed. But those who prefer the new-fashioned *standard deviation* can easily pass from our results to those which they require by dividing our a by $\sqrt{2}$, our κ by $\sqrt{2}$ and our λ by 2. When, as proves often to be the case, we have to do only with even powers of κ, there will be substituted for κ the new symbol λ.

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* *Contributions to the Mathematical Theory of Evolution*, No. xiv, pp. 4, 5.

† I shall generally employ the modern notation for division—μ_4/μ_2^2 for the old-fashioned $\frac{\mu_4}{\mu_2^2}$.

The first two of the *quæsita* are connected with the data, and the remaining *quæsita* by very simple relations, namely*—

$$M = -\tfrac{1}{2}\kappa$$

$$\mu_2 = \tfrac{1}{2}a^2\left(1 + \kappa^2 + 3\lambda + \frac{15}{4}\lambda^2\right).$$

But the remaining *quæsita* χ $(= \kappa^2)$ and λ are connected with the data by relations which are very far from simple, namely, the simultaneous equations:—

$$\text{I.}\quad 8\chi\left(\frac{3}{2} + \chi + 9\lambda + \frac{135}{8}\lambda^2\right)^2 = \beta_1\left(1 + \chi + 3\lambda + \frac{15}{4}\lambda^2\right)^3.$$

$$\text{II.}\quad 4\left(6\chi + 3\lambda + 3\chi^2 + 54\chi\lambda + 27\lambda^2 + 135\chi\lambda^2 + \frac{405}{4}\lambda^6 + \frac{1215}{8}\lambda^4\right) = \eta\left(1 + \chi + 3\lambda + \frac{15}{4}\lambda^2\right)^2$$

Using the constants $\beta\left(= \frac{1}{8}\beta_1\right)$ and $\epsilon\left(= \frac{1}{12}\eta\right)$, we may write these fundamental equations as follows :—

$$\left\{\begin{array}{l} \text{I}\quad \chi^3 + 2\chi^2 Q + \chi Q^2 = \beta(\chi + R)^3. \\ \text{II.}\quad \chi^2 + 2\chi S + T = \epsilon(\chi + R)^2 ; \end{array}\right.$$

where

$$Q = 1{\cdot}5 + 9\lambda + \frac{135}{8}\lambda^2 ;$$

$$R = 1 + 3\lambda + \frac{15}{4}\lambda^2 ;$$

$$S = 1 + 9\lambda + \frac{45}{2}\lambda^2 ;$$

$$T = \lambda + 9\lambda^2 + \frac{135}{4}\lambda^3 + \frac{405}{8}\lambda^4.$$

The first impression produced on the mathematical reader by the problem thus stated will be unfavourable ; the above-written equations seem unmanageable. To obtain a general solution it would be proper first to eliminate one or other of the variables, obtaining either an equation of the *twelfth* degree for λ or one of the *eighteenth* degree for χ. Taking the easier alternative, we should next have to separate the roots of an equation of the twelfth degree by Sturm's laborious method. What if all the values of λ are impossible, as may be apprehended, the degree of the equation being even ! What if the possible values of λ correspond to *negative* values of χ, which would be inadmissible ! The immense labour of employing Horner's method to evaluate the roots numerically might be greatly multiplied by the necessity of choosing a suitable pair. In short, the canon of facility would be egregiously violated ; the method would be impracticable.

This objection would be fatal if there were not more than meets the eye in the above statement of the problem. The case is as if a pure mathematician were confronted for the first time with the problem of determining the internal movements of the solar system. He might justly regard the problem as impracticable if stated in general terms as requiring him to ascertain numerically the motions of *nine* or more bodies moving in vacuo, according to the law of gravitation. But when it is given that all but one of the bodies are small compared to that one, with certain other concrete circumstances of position and velocity, it is seen that approximate solutions are possible. So, to compare small things with great, the terrors of our fundamental equations are mitigated by certain supplementary conditions. If indeed all positive values of the constant β and all values whatever of the constant ϵ were admissible, there would be tracts of value where the search for the roots of our equations would be impracticable. But these unmanageable cases are ruled out by certain concrete conditions, of which the principal are: (*a*) that the constants β and ϵ are small fractions; (*b*) that the curve to be constructed has some affinity or at least resemblance to the normal curve.

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* For the establishment of all these equations see *Congress Paper*, p. 4.

Firstly (*a*) experience shows that the constants β and ϵ are very rarely in the statistics with which we have to do as large as unity. Such a size would imply that Professor Pearson's β_1 was not less than 8, his η not less than 12. Practically I think the statistician is seldom or never called on to deal with constants larger than those found by Professor Pearson for the lips of Medusa,* namely, $\beta_1 = 4 \cdot 168$ and η $(= \beta_2 - 3) = 9 \cdot 376$; corresponding to our $\beta = \cdot 521$, $\epsilon = \cdot 7813$. That may fairly be considered an extreme case, I submit. Now the range of value for ϵ and β respectively between zero and those two fractions will be found to correspond to the range of value for χ and λ respectively between 0 and ·2. In fact, if ·2 is substituted for each of the variables χ and λ in the expressions for the constants β and ϵ presented by our fundamental equations (I and II) there result almost exactly the coefficients pertaining to the lips of Medusa. But, indeed, this is an extreme case. The range of χ and λ is seldom required to exceed ·1. Thus if we assign that value to each of the variables in the fundamental equations we shall find for β ·243 and for ϵ ·321; closely corresponding to the values of β_1 $(= 8\,\beta)$ and η $(= 12\,\epsilon)$, given by Professor Pearson for Ages of Bride at Marriage, viz., 1·9396 and 3·8873 respectively.† But such large values of η and β_1 are by no means of every-day occurrence.

Secondly (*b*), the relation between the constants (β and ϵ) may be inconsistent with a due similarity to the normal curve. This inadmissible abnormality occurs principally in two cases. The constructed curve may stop short, the ordinate changing discontinuously from one to another quite different value. Or the curve may turn up; the ordinate passing through a *minimum* value, whether in addition to, or even in the absence of the regulation *mode* or *maximum* (presenting a U-shaped curve). The first defect is liable to be produced by the abrupt change of the ordinate from $+\infty$ to $-\infty$. To illustrate this phenomenon we may revert to the primary conception of *translation*, and suppose each element of a normal error-curve distant x from some point other than the median, say O, to be transported to a distance X, which is some function of x. If that function is the *square*, or one which shares certain properties with the square, as the distance x diminishes below unity the elements of the translated curve will be more and more huddled together until in the limit, at the point O, the base of the translated element becomes zero and its height infinite. Below this point the operation becomes unmeaning or can only mean that the elements of the original curve are swung round from the left to the right of (the ordinate at) O. Fig. 1, reproduced from my first paper on this method,* renders further description unnecessary. It will be observed that the figure presents not only a discontinuity at the point O, but also a minimum at B; illustrating the second defect through which condition (*b*) is liable to fail.

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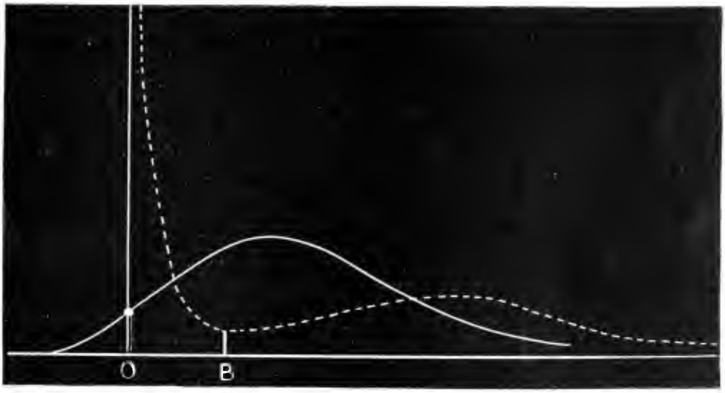
* "Mathematical Contributions," No. XI, *Phil. Trans.*, 1901, A.

† "Contributions," No. XI, *Phil. Trans.*, 1901, p. 451.

FIG. 1.



These conditions are favourable to calculation. The occurrence of small quantities of which the higher powers may be neglected—which proves so convenient in Astronomy and other branches of Mathematical Physics—is guaranteed by our first condition, at least, when it is interpreted strictly. Both conditions avail to limit the extent of the investigation. The practitioner obtains the assurance that the search for roots of the equations or the construction of tables will be limited to a comparatively small tract. Not only the extent but the intensity of his labour is reduced. For the demarcated field is particularly suitable for his operations as compared with the rugged regions beyond the frontier.

But when we speak of boundaries it should be understood that exact demarcations are not always possible. It will not indeed be surprising that the distinction between "large" and "small" should be somewhat conventional. But, with respect to the other condition, it might be expected that a break in the curve or a minimum ordinate are attributes not admitting of degree. Even here, however, the character of variable quantity creeps in. For in practice it will often be sufficient to secure not that there should be no flaw in our construction, but only none that is perceptible. Theoretically the normal curve which is to be translated extends to infinity. But at a comparatively short distance from the centre, say two or three times, the *modulus*—three or four times the *standard deviation*—the frequency represented by the curve becomes exceedingly small. Accordingly, an imperfection of the kinds represented at points O and B of Fig. 1 occurring at such a distance from the centre would never be noticed. We may avail ourselves of the maxim—*De non apparentibus*.

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* *J.R.S.S.*, vol. LXI (1898), p. 696.

From this introductory survey it appears that the subject of this section falls naturally into three divisions, according as the divergence from the normal curve which forms the generic attribute is very slight, moderate, or very great.

SUBSECTION I.—SLIGHTLY ABNORMAL CURVES.

If the constructed curve diverges but slightly from the normal, the constants which indicate that divergence, β and ϵ, must be small. But when both these given constants are small, the sought coefficients χ and λ, which are connected by those constants by the fundamental equations I and II, are evidently also small. In fact, the coefficients may be treated as of the same order of magnitude as the constants (when the latter are small). Accordingly, if the constants β and ϵ are *very* small, the equations become *linear*. We may write down at once—neglecting powers and products of χ and λ—

$$\text{I. } \chi\, 2 \cdot 25 = \beta$$
$$\text{II. } 2\chi + \lambda = \epsilon$$

Whence $\chi = \frac{4}{9}\beta$; $\lambda = \epsilon - \frac{8}{9}\beta$.

Examples of this first approximation are furnished in Table I (third column). Examples in abundance may be found among the varied statistics which purport to show the fulfilment of the normal law of error. For very generally the fulfilment is not so perfect but that a slight divergence from normality may be detected. Of course, it should be determined by the proper tests that this divergence is not merely apparent, due to the roughness of the observations. But for the present purpose of exposition I have not thought it necessary to take the trouble of applying those tests; I take the data entered in the tables at their face value.

So far we have not made much progress. For the very slightly abnormal cases may be perfectly well treated by the use of the Generalised Law of Error, set forth in former papers.* We pass on to somewhat fresher ground when we suppose that the constants β and ϵ are small, but not very small; not so small that their squares and binary products may be neglected, only cubes with ternary products, and terms of a higher order. The following appears to be a convenient method of treating this case.

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* The applicability of the generalised formula to slightly, not to say moderately, abnormal shapes has been verified by Mr. Palin Elderton, Fourth Congress of Mathematicians (1908, Rome).

Presuming that the sought χ and λ are of the same order as the given β and ϵ, let us omit in the given equations all quantities of the *third* order, including not only ternary combinations of χ and λ alone, but also mixed combinations of coefficients and constants, such as $\chi^2\beta$, $\chi^2\epsilon$, $\chi\lambda\beta$, $\lambda\beta^2$ . . . . The equations thus reduced may be written—

$$\text{I. } A\chi^2 + B\chi + C = 0.$$
$$\text{II. } A'\chi^2 + B'\chi + C' = 0;$$

where $A = 3$, $B = \left(\frac{9}{4} - 3\beta\right) + \lambda(27 - 18\beta)$, $C = -\beta(1 + 9\lambda)$;

$$A' = 1,\ B' = 2 - 2\epsilon + \lambda(18 - 6)\epsilon,\ C' = -\epsilon + \lambda(1 - 6\epsilon) + 9\lambda^2.$$

Now proceed to eliminate χ from these equations by the well-known formula*

$$[AC']^2 + [BA'][BC'] = 0.$$

Let the expansion be carried so far as to comprise all the binary combinations of β, ϵ and λ. Then neglecting at first quantities of the second order we obtain (as we ought) for a first approximation, say λ_1, $\epsilon - \frac{8}{9}\beta$. For the second approximation, say λ_2, there results

$$\lambda_1, \frac{-784}{243}\beta^2 + \frac{56}{9}\epsilon\beta - 3\epsilon^2.$$

The value thus found for λ is to be substituted in one of the (reduced) equations; and the corresponding value of χ to be thence deduced.

The reader may satisfy himself as to the accuracy of the formula by the following verification. Assume some (easily handled) values of χ and λ; construct β and ϵ therefrom (using the reduced equations), and inserting the constructed values of β and ϵ in the formula observe that the original values of χ and λ result. For instance, let $\lambda = 0$; while χ is a small quantity of which powers above the second may be neglected, say $\chi = \delta$. We have then from the (reduced) fundamental equations—

$$\beta\,(1 + 3\delta) = 2{\cdot}25\delta + 3\delta^2.$$

Dividing the right side of this equation by the coefficient of β, and neglecting powers of δ above the second, we have—

$$\beta = 2{\cdot}25\delta - 3{\cdot}75\delta^2.$$

Likewise $\epsilon = 2\delta - 3\delta^2$. Now put these values of β and ϵ into the formula, and we get out for λ, $2\delta - 2\delta, + \delta^2 \times 0$; $= 0$, as we ought. Again let $\lambda = \chi =$, say, δ. Then by parity of reasoning we obtain $\beta = 2{\cdot}25\delta + 3\delta^2$; $\epsilon = 3\delta + 4\delta^2$. Substituting these values of the constants in the formula we obtain, as we ought, for λ

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* *Cf.* Salmon's *Higher Algebra*, Art. 75.

the approximate value δ. It will be observed that in this case the correction pertaining to the second approximation, namely—

$$-3{\cdot}226\,..\,\beta^2 + 6{\cdot}2\beta\epsilon - 3\epsilon^2,$$

is particularly small. There is thus suggested the useful rule that the first approximation is particularly safe when the constants (β and λ) are nearly equal.

In Table I are given examples of this formula. For convenience of calculation in forming the values of β and ϵ (from the given values of β and η) I have stopped at the third place of decimals. But the reader is at liberty to regard the figures in the table as the true ones, in order to appreciate the accuracy of the approximation. It seems to be accurate enough for the not very large constants adduced. In fact it may be usefully employed for larger constants; since, even when not accurate enough, it may afford a start for a more accurate approximation. In this respect the proposed formula has an advantage over the Generalised Law of Error; which latter, it may be remembered, is theoretically applicable* where the divergence from the normal is of the order so far contemplated.

TABLE I.—*Approximation to the value of λ for frequency-groups with small (β and ϵ) constants.*

β (β_1)	ϵ (η)	First approximation.	Second approximation.	Authority and reference.
·004 (*·0287*)	− ·017 (*−·2036*)	− ·0206	− ·0219	Pearl (*Brainweights*), *Biom.*, IV, p. 38, Table VIII, Ex. 1.
·022 (*·174*)	·005 (*·06*)	− ·0145	− ·0154	Pearson (*Pauperism*), Contribution II, *Trans. Roy. Soc.*, 1895 A, Ex. 14.
·016 (*·124*)	·02 (*·235*)	·0058	·0058	Pearson (*Statures*), *loc. cit.*, Ex. 4.
·015 (*·1226*)	·030 (*·3653*)	·0167	·0161	Pearson (*Barometric Heights*), *Trans. Roy. Soc.*, vol. 190 (1897), Southampton.
·016 (*·1311*)	·028 (*·3415*)	·0138	·0131	Pearson (*Barometric Heights*), *loc. cit.*, Babbacombe.
·031 (*·244*)	·015 (*·174*)	− ·0126	− ·0134	Pearson (*Barometric Heights*), Contribution II, *loc. cit.*, Ex. 1.
·016 (*·1312*)	·031 (*·3682*)	·0168	·0162	Pearl (*Brainweights*), *Biom.*, IV, p. 38, Ex. 3.
·013 (*·1040*)	·035 *·4210*)	·0234	·0221	Pearson (*Barometric Heights*), *loc. cit.*, Stonyhurst.
·025 (*·20204*)	·026 (*·3157*)	·0038	·0038	Pearson (*Barometric Heights*), *loc. cit.*, Armagh.
·015 (*·2156*)	·042 (*·5014*)	·0287	·0266	Pearson (*Barometric Heights*), *loc. cit.*, Margate.

(*To be continued.*)

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* Professor Mahaim found that the second approximation given by the Generalised Law of Error applied to statistics was not satisfactory, I suppose owing to the circumstance that quotations of wages have not that degree of *independence* which the theory requires (see *La loi d'erreur de M. F. Y. Edgeworth* Révue des Mines . . (Liége), 1908).

NOTE ON A POSSIBLE SOURCE OF FALLACY IN THE INTERPRETATION OF THE CENSUS FIGURES RELATING TO THE FERTILITY OF MARRIAGES. By E. C. SNOW, M.A., D.Sc.

IN the discussion on Dr. Dunlop's Paper, contained in this issue of the *Journal*, it is suggested that figures showing that the completed families of parents living in 1911 varied, roughly, according to the date of marriage, did not give absolute proof of decline in fertility. The evidence supporting this view was derived from the indications of the heavier mortality of parents with small families over those with large ones, the inference being that, in dealing only with families of which the parents were living at the census date, the naturally small families were not represented in their true proportion.

It is important to ascertain if a similar relationship between size of completed family and date of marriage (when correction is made for age at marriage) exists in a population in which no decline in fertility has occurred, and to examine if other deductions made from the data are likely to be affected by the consideration mentioned. Material for this is provided by the census returns for Ireland. The fertility of marriages in that country has declined very little during the past forty years, the number of legitimate births per 1,000 married women between 15 and 45 in each of the last five census years being 308·9, 283·0, 293·5, 288·3 and 295·0 respectively; the corresponding figures for Scotland are 317·4, 313·1, 300·4, 272·4 and 232·0. The table below gives for Ireland certain information for marriages in which the wife had reached the age of 45 at least at the date of the census. If we fix attention upon the (completed) families derived from marriages in which the wife was of a certain age (say 30–34) at marriage and the husband also of a stated age (say, again, 30–34), and trace the average size of family according to duration of marriage, we find that it invariably increases with the duration, just as in the case of the Scottish marriages. In the particular case referred to the figures run 4·08, 4·53, 4·89 and 5·60. In other words, marriages of the type stated which occurred in 1876–1881 apparently produced an average of 5·60 children, while similar marriages in 1886–1891 only produced, on the average, 4·53 children. A like statement is true for every one of the 24 cases (with one very slight exception, and in this—wife marries at 35–40, husband at under 25—the number of instances is small) for which comparison can be made.

That the Irish figures are far from being all that one would desire must be admitted, but there appears to be no reason why the defects should tend to exaggerate the size of the (completed) families of older parents in comparison with those of younger ones. As the question of declining fertility does not here arise, I believe that the Irish data bring definite evidence showing that, on the average, the parents of naturally small families do not survive to old age in the same proportion as do other parents. If this be true, it follows that even where decline in fertility is known to have occurred, figures arranged in the form of those at the end of this note and of Tables XI, XII and XIV of Dr. Dunlop's Paper do not give a satisfactory indication of the decline.

We must also inquire if this probable differential mortality is likely to affect other conclusions that may be drawn from fertility figures. Suppose we require to find what particular age of husband at marriage, for a stated age of wife, leads, on the average, to the largest family. I take for examination the column in the table below in which the wife at marriage was 25–29 and the duration of marriage 20–24 years. From this we get the following :—

Age of husband at marriage	Under 25	25—29	30—34	35—39	40—44	Over 45
Average family	5·57	5·78	5·83	5·98	5·78	5·27

At first sight the course of these figures suggests that the family is likely to be greatest when the husband is about 36 or 37 at marriage, or about 10 years older than the wife—a rather unexpected result. Such a conclusion, however, is open to the same possible fallacy as before. The husbands who were aged 35–39 at marriage were, in 1911, between 55 and 64 ; those married at age 25–29 were, in 1911, only between 45 and 54. The former cohort had been depleted by death to a larger extent than had the latter, and, if the conclusion concerning the smaller power of survival of the parents of small families be correct, this would more than account for the apparent increase in size of family of the men married between 35 and 39.

A similar phenomenon of increase in size of family according to higher age of husband at marriage is to be noted in a number of the columns in the table below, though, when the husband is over 40 at marriage his natural infertility predominates and causes the average family to be smaller. It will be noticed that, starting with a particular average family figure in the table—say the 5·57 relating to wives married at 25–29, husbands at under 25, and duration of marriage 20–24 years—the increase as we move horizontally from left to right is much greater than that as we move vertically downwards. This suggests that, when we correct for the differential mortality we have noted, the fertility of husbands decreases more or less directly with age. This, of course, is a very rough way of looking at the figures, and for a proper determination of the decrease in fertility of man with age more exact methods must be used.

The same consideration *may*, though it is not certain that it does, affect the comparison of the fertility of men in different occupations. If we compare the average families (as in Table X of Dr. Dunlop's

Paper) of general labourers (6·29 children) and of clergymen (4·33 children), the difference—1·96—may be in excess of the figure for true relative fertility. This arises from the fact that the labourers suffer from a heavier mortality than do the clergy, and if this mortality be negatively associated with fertility the naturally small families produced by the clergy were represented in 1911 in a larger proportion than were the small families of the labourers.

The annual volumes of *Vital Statistics* relating to the population of the Australian Commonwealth appear at first sight to contain excellent material for the solution of the question of whether or not the mortality of parents is in any way correlated with the number of offspring they have produced. On closer examination, however, the data they contain are found to require considerable analysis before all the extraneous factors influencing the figures can be allowed for, and this analysis cannot be done in a short space. So far as they have been examined, the Australian statistics do not controvert the view taken up in this note. I think, however, that the figures from Ireland (referring, as they do, to a population in which the fertility has been approximately constant over a long period) give the strongest evidence yet adduced in favour of that view.

Census of Ireland, 1911. *Statistics relating to fertility of marriages.*

Husband married at age	Wife married at 20—24.				Wife married at 25—29.					
	Duration of marriage.				Duration of marriage.					
	25—29 years.		30—34 years.		20—24 years.		25—29 years.		30—34 years.	
	No. of families.	Average family.	No. of families.	Average family.	No. of families.	Average family.	No. of families.	Average family.	No. of families.	Average family.
Under 25	5,977	7·48	4,777	7·89	1,681	5·57	1,370	6·14	1,182	6·55
25–29	4,667	7·54	3,865	7·92	5,473	5·78	4,128	6·31	3,537	6·62
30–34	3,055	7·62	2,748	8·02	3,813	5·83	2,910	6·28	2,654	6·82
35–39	1,523	7·54	1,700	7·94	2,372	5·98	1,774	6·60	1,999	6·88
40–44	859	7·42	685	7·23	1,163	5·78	1,093	6·14	760	6·33
Over 45	342	6·40	190	6·97	954	5·27	446	5·53	251	6·01

Husband married at age	Wife married at 30—34.							
	Duration of marriage.							
	15—19 years.		20—24 years.		25—29 years.		30—34 years.	
	No. of families.	Average family.	No. of families.	Average family.	No. of families.	Average family.	No. of families.	Average family.
Under 25	590	4·02	420	4·12	368	4·67	381	5·25
25-29....	1,559	3·88	1,171	4·21	995	4·56	915	5·13
30–34....	3,289	4·08	2,592	4·53	2,061	4·89	1,997	5·60
35–39....	2,115	4·16	1,776	4·47	1,360	5·05	1,727	5·62
40–44....	1,377	3·87	1,136	4·50	1,030	5·00	848	5·35
Over 45	1,209	3·40	972	4·01	483	4·41	277	4·81

Husband married at age	Wife married at 35—39.									
	Duration of marriage.									
	10—14 years.		15—19 years.		20—24 years.		25—29 years.		30—34 years.	
	No. of families.	Average family.	No. of families.	Average family,	No. of families	Average family.	No of families	Average family.	No. of families.	Average family.
Under 25	121	2·12	130	2·52	119	2·93	111	3·72	177	3·47
25–29	483	2·17	393	2·40	326	2·85	288	3·33	153	3·71
30–34	867	2·16	787	2·60	605	3·03	504	3·42	629	3·65
35–39	1,687	2·34	1,225	2·65	1,065	3·27	809	3·42	1,322	4·02
40–44	1,082	2·14	800	2·69	726	3·01	666	3·78	759	3·95
Over 45	1,375	1·85	1,017	2·15	807	2·90	463	3·04	280	3·44

A STUDY OF INDEX CORRELATIONS.

By J. W. BROWN, M. GREENWOOD, Jr., and FRANCES WOOD.

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A PROBLEM of some importance in Medical Statistics is of the following nature. In a series of districts with population z_0, z_1, z_2, &c., the deaths from a certain disease are x_0, x_1, x_2, &c., and from some other disease, y_0, y_1, y_2, &c., is there any association between the x's and y's which is independent of the common relation of each with z? Assuming that the question of differences in age constitution does not arise, it would appear at first sight that all we require is either ${}_zr_{xy}$ or ${}_zr_{\frac{x}{z}\frac{y}{z}}$ and that these constants should not differ in value. Thus, in a recent note, Professor Karl Pearson writes:—"Now it is easy to show that the correlation of $\frac{\delta}{p}$ and $\frac{\delta'}{p}$ for p constant is precisely the same thing as the correlation of δ and δ' for p constant."* The δ and δ' of this quotation are our x and y and the p is our z. The proof is as follows:—

Looking at the problem from the standpoint of algebra, we have:—

$$ {}_zr_{\frac{x}{z}\frac{y}{z}} = \frac{r_{\frac{x}{z}\frac{y}{z}} - r_{\frac{x}{z}z}\, r_{\frac{y}{z}z}}{\sqrt{\{(1 - r^2_{\frac{x}{z}z})(1 - r^2_{\frac{y}{z}z})\}}} \qquad (1)$$

But, if deviations are small compared with the mean:—†

$$ r_{\frac{x}{z}\frac{y}{z}} = \frac{\frac{\sigma_x}{\bar{x}}\frac{\sigma_y}{\bar{y}} r_{xy} - \frac{\sigma_x}{\bar{x}}\frac{\sigma_z}{\bar{z}} r_{xz} - \frac{\sigma_y}{\bar{y}}\frac{\sigma_z}{\bar{z}} r_{yz} + \frac{\sigma^2_z}{\bar{z}^2}}{\sqrt{\left\{\left(\frac{\sigma^2_x}{\bar{x}^2} + \frac{\sigma^2_z}{\bar{z}^2} - 2\frac{\sigma_x}{\bar{x}}\frac{\sigma_z}{\bar{z}} r_{xz}\right)\left(\frac{\sigma^2_y}{\bar{y}^2} + \frac{\sigma^2_z}{\bar{z}^2} - 2\frac{\sigma_y}{\bar{y}}\frac{\sigma_z}{\bar{z}} r_{yz}\right)\right\}}}, \qquad (2)$$

$$ r_{\frac{x}{z}z} = \frac{\frac{\sigma_x}{\bar{x}} r_{xz} - \frac{\sigma_z}{\bar{z}}}{\sqrt{\left(\frac{\sigma^2_x}{\bar{x}^2} - 2\frac{\sigma_x}{\bar{x}}\frac{\sigma_z}{\bar{z}} r_{xz} + \frac{\sigma^2_z}{\bar{z}^2}\right)}}, \qquad (3)$$

$$ r_{\frac{y}{z}z} = \frac{\frac{\sigma_y}{\bar{y}} r_{yz} - \frac{\sigma_z}{\bar{z}}}{\sqrt{\left(\frac{\sigma^2_y}{\bar{y}^2} - 2\frac{\sigma_y}{\bar{y}}\frac{\sigma_z}{\bar{z}} r_{yz} + \frac{\sigma^2_z}{\bar{z}^2}\right)}} \qquad (4)$$

Substituting these values in (1) and reducing, we obtain:—

$$ \frac{r_{xy} - r_{xz}\, r_{yz}}{\sqrt{\{(1 - r^2_{xz})(1 - r^2_{yz})\}}} \qquad (5)$$

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* *Journal of the Royal Statistical Society*, LXXIII, 1910, p. 536.

† Pearson, *Proc. Roy. Soc.* lx, 1897, p. 489.

which is ${}_z r_{xy}$. In precisely the same way we can show that ${}_{\frac{1}{z}} r_{\frac{x}{z}\frac{y}{z}} = {}_z r_{xy}$. These results depend on the assumption that in such expansions as $\left(1 + \frac{\epsilon_x}{\bar{x}}\right)^{-1}$ (where ϵ_x is a variation from the mean, $\bar{x}$.) terms beyond the third may be neglected. Let us express ${}_z r_{\frac{x}{z}\frac{y}{z}}$ in terms of product moments, using a method devised by Pearson for the study of index frequencies.*

Put $z = \frac{1}{w}$, let p denote an xw moment coefficient about zero, p' a yw moment coefficient about zero, and P a moment coefficient involving an (xw) or (yw) *i.e.*, $(xw)\ w$ or $w\ (yw)$ or $(xw)(yw)$. A symbol with a line above it denotes the mean value of the symbol and the subscript numerals denote the order of the product, *i.e.*, $p_{22} = \frac{Sx^2w^2}{N}$.

We have—

$$(\overline{xw}) = p_{11},\ (\overline{yw}) = p'_{11}$$

$$\sigma^2{}_{xw} = p_{22} - p^2{}_{11},\ \sigma^2{}_{yw} = p'_{22} - p'^2{}_{11}.$$

$$r_{(xw)(yw)} = \frac{P_{(xw)(yw)} - p_{11}p'_{11}}{\sqrt{\{(p_{22} - p^2{}_{11})(p'_{22} - p'^2{}_{11})\}}} \qquad r_{(xw)w} = \frac{P_{(xw)w} - \bar{w}p_{11}}{\sqrt{\{\sigma^2{}_w(p_{22} - p^2{}_{11})\}}}$$

$$r_{(yw)w} = \frac{P_{(yw)w} - \bar{w}p'_{11}}{\sqrt{\{\sigma^2{}_w(p'_{22} - p'^2{}_{11})\}}}$$

hence—

$${}_w r_{(xw)(yw)} = \frac{\sigma^2{}_w(P_{(xw)(yw)} - p_{11}p'_{11}) - (P_{(wx)w} - \bar{w}p_{11})(P_{(yw)w} - \bar{w}p'_{11})}{[\{\sigma^2{}_w(p_{22} - p^2{}_{11}) - (P_{(wx)w} - \bar{w}p_{11})^2\}\ \{\sigma^2{}_w(p'_{22} - p'_{11}) - (P_{(wy)w} - \bar{w}p'_{11})^2\}]^{\frac{1}{2}}} \qquad (6)$$

This may be verified by referring the product moments to the means and dividing out. The expression evidently becomes:

$$\frac{r_{(xw)(yw)} - r_{(wx)w} \cdot r_{(wy)w}}{\sqrt{\{(1 - r^2{}_{(wx)w})(1 - r^2{}_{(wy)w})\}}} \qquad (7)$$

From what has already been proved we know that this is equal to ${}_w r_{xy}$ or ${}_{\frac{1}{w}} r_{xy} = {}_z r_{xy}$ provided deviations from the means are sufficiently small to admit of our using (2), (3) and (4).

Should this condition not be fulfilled, the further reduction of (6) or (7) must depend on the nature of the regression equations connecting x, y and w. If we assume $(w - \bar{w}) = R_1\ (x - \bar{x}) + R_2\ (y - \bar{y})$, (6) can be expressed in terms of product moments, involving x and y, and of the regression coefficients, but such an assumption would not be, in general, compatible with a linear relation connecting x, y and $\frac{1}{w}$. There is accordingly no reason to expect that ${}_z r_{xy}$ will generally be the same as ${}_z r_{\frac{x}{z}\frac{y}{z}}$.

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* *Idem, Biometrika*, vii, 1909-10, p. 531.

In Table 1 are collected examples of ${}_z r_{xy}$ and ${}_z r_{\frac{x}{z}\frac{y}{z}}$ which we have worked out. With regard to the material upon which this and several other tables are based, we may remark that it was not collected for the purpose of this paper and that its actual significance will be discussed elsewhere. The present paper is exclusively devoted to a question of method. We have purposely excluded the consideration of the question of age influence as not relevant to the subject; in the table, however, some values of ${}_z r_{xy}$ and ${}_z r_{\frac{x}{z}\frac{y}{z}}$ are given for data which have been corrected for age distribution.

An inspection of the table suggests certain remarks. Thus in some cases the differences are large, although not necessarily significant, and in most cases ${}_z r_{xy}$ is larger than ${}_z r_{\frac{x}{z}\frac{y}{z}}$. Another point to be noted is the fact that ${}_z r_{\frac{x}{z}\frac{y}{z}}$ rarely differs significantly from $r_{\frac{x}{z}\frac{y}{z}}$. The practical importance of this is that, were we satisfied that ${}_z r_{\frac{x}{z}\frac{y}{z}}$ was the correct constant to employ, our turn would be served by $r_{\frac{x}{z}\frac{y}{z}}$ and much labour would be saved. Having demonstrated the large discrepancies which may exist between the values of ${}_z r_{xy}$ and ${}_z r_{\frac{x}{z}\frac{y}{z}}$ we may state the object of this communication as being:—(1) to ascertain which coefficient should be employed in ordinary practice, (2) to discover if possible the source of the discrepancy.

In the first place it is to be observed that the actual numerical value of ${}_z r_{xy}$ is much more influenced by the presence in a series of data of a few very large absolute values than is ${}_z r_{\frac{x}{z}\frac{y}{z}}$.

This statement, which mainly applies when the number of observations is small and the coefficient of variation large and greatly influenced by the presence of certain values, could be expressed symbolically, but it seems better to proceed at once to arithmetical illustrations. To exhibit the effect in an exaggerated form we give an imaginary case (Table 2). We then pass to cases which actually have arisen or might arise in practice (Table 3).

The import of these results deserves rather careful consideration, and the following train of ideas at once presents itself. We find that ${}_z r_{xy}$ is much more sensitive than ${}_z r_{\frac{x}{z}\frac{y}{z}}$ to the introduction of data differing greatly from the original material in absolute measurements. But we know that the mixing of heterogeneous records having entirely different mean values leads to the production of correlations which are "spurious" and do not measure any real association between the variables. Consequently, it may perhaps be said, a method which is sensitive to such effects is much superior to one that registers them far less plainly. In other words, the use of ${}_z r_{xy}$ will put us on our guard against spurious correlation due to mixture, since we can check our results by dividing the data into roughly homogeneous series and recalculating the constants.

We have no doubt that these remarks will commend themselves to many statisticians, but we are ourselves unable to admit their sufficiency. We must remember that the word heterogeneity has no absolute significance, a series may be heterogeneous from one point of view and perfectly homogeneous when examined from another standpoint. If we mix together a number of millionaires and a sample of general labourers, the mixture may be perfectly homogeneous in respect of racial type, stature, age, weight, although wildly heterogeneous in respect of weekly income. The sample might be a perfectly appropriate one for the determination of stature and weight correlations, however inappropriate for the study of the correlation between either variable and income. In our actual problem it does not seem to us that a method which is greatly influenced by absolute variations in population should necessarily be superior to one not so influenced. Always provided that the absolute size of any population in the series is such that a ratio based thereon is not fundamentally unreliable, we do not see why our results should be in effect weighted by size or that an observation based on ten thousand inhabitants should tell less than one based on a million. Of course, in some problems this would not be true, but we contend that as a general proposition we have no right always to regard absolute magnitude as an element to be taken into account. The problem now under discussion is cognate with that considered by Mr. Yule in a recent paper.* Without necessarily assenting to all his conclusions, we should be disposed to think that the relative constancy of ${}_zr_{\frac{x}{z}\frac{y}{z}}$ is an argument in favour of its use in preference to that of ${}_zr_{xy}$ in the short series mostly available for work on the correlation of death and morbidity returns, where the size and even the sign of ${}_zr_{xy}$ may be determined, in extreme cases, by a single observation.

We must now look somewhat more closely into the causes of the discrepancy between ${}_zr_{xy}$ and ${}_zr_{\frac{x}{z}\frac{y}{z}}$. In the case of absolute numbers where each observation is weighted by its actual size, the presence of one large value may determine to a considerable extent the slope of the regression surface. When dealing with indices the weights of the different observations are approximately the same, owing to the fact that the correlations between x and z and y and z are positive and high, and that neither x nor y can ever be greater than z, so that in this case no single observation can have any predominating effect in determining the slope of the regression surface.

It is true that the sizes of the different populations vary to the same extent as when absolute numbers are used, but $r_{\frac{x}{z}z}$ and $r_{\frac{y}{z}z}$ are usually small, and produce little effect on the total correlation $r_{\frac{x}{z}\frac{y}{z}}$, when the partial correlation with z constant is calculated.

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* *Journal of the Royal Statistical Society*, LXXIII, 1910, p. 644.

The considerable relative changes produced in $r_{\frac{x}{z}z}$ and $r_{\frac{y}{z}z}$ by the addition of a single observation with a very large population, have comparatively little effect on ${}_zr_{\frac{x}{z}\frac{y}{z}}$. (See Table 3.)

We must now consider whether the forms of the two regression surfaces are likely to vary markedly in the two cases.

We know that the complete interpretation of any coefficient of correlation involves a knowledge of the form of the regression. If the coefficient of correlation between a and b be ·5, and that between c and d be also ·5, it does not follow that the closeness of the relationship is identical in the two cases unless the regression is of the same form in both. This fact suggested the possibility that the difference between ${}_zr_{xy}$ and ${}_zr_{\frac{x}{z}\frac{y}{z}}$ might also depend upon a want of congruence between the forms of their respective regression surfaces. If the three variables are distributed normally we know that variations from the mean of one may be represented effectively in terms of variations from the respective means of the others by an equation of the first degree, that is, the regression may be described as planar. Now assuming that variations in x may be represented in terms of variations of y and z by a first degree equation, does it necessarily follow that variations in $\frac{x}{z}$ may similarly be represented in terms of z and $\frac{y}{z}$? Evidently there is no *prima facie* reason. Some *a priori* considerations do indeed point directly away from any such conclusion. In attempting to ascertain the nature of the distribution of $\frac{x}{y}$ in terms of the constants of the distributions of x and y, assuming that $r_{xy} = 0$ one of us obtained the following expressions for the mean and first four moment coefficients :—*

$$i = \left(\frac{\bar{x}}{\bar{y}}\right)\left\{1 + v^2{}_x - \frac{\mu'_3}{\bar{y}^3} + \frac{\mu'_4}{\bar{y}^4} \text{ \&c. }\right\} \tag{8}$$

$$\text{M}_2 = \left(\frac{\bar{x}}{\bar{y}}\right)^2\left\{v^2{}_x + v^2{}_y - \frac{2\mu'_3}{\bar{y}^2} + 3v^2{}_x v^2{}_y + \frac{3\mu'_4 - 2\mu_2'^2}{\bar{y}^4} \text{ \&c. }\right\} \tag{9}$$

$$\text{M}_3 = \left(\frac{\bar{x}}{\bar{y}}\right)^3\left\{\frac{\mu_3}{\bar{x}^3} - \frac{\mu'_3}{\bar{y}^3} + \frac{6\mu_2\mu'_2}{\bar{x}^2\bar{y}^2} + \frac{3\,(\mu'_4 - \mu_2'^2)}{\bar{y}^4} \text{ \&c. }\right\} \tag{10}$$

$$\text{M}_4 = \left(\frac{\bar{x}}{\bar{y}}\right)^4\left\{\frac{\mu_4}{\bar{x}^4} + \frac{\mu'_4}{\bar{y}^4} + \frac{6\mu_2\mu'_2}{\bar{x}^2\,\bar{y}^2} \text{ \&c. }\right\} \tag{11}$$

The order of approximation is not the same in the different terms, but the expressions suffice to show that given symmetry in the original distributions, *i.e.*, $\mu_3 = \mu'_3 = 0$, the distribution of indices will not be symmetrical, under the conditions assumed. These results suggest—they do no more—that were the distributions of absolute values *approximately* normal the indices might not be normal.

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* *Biometrika*, vii, 532.

It accordingly seemed desirable to go carefully into the question as to whether the regression surfaces were different in the case of indices and absolute numbers.

We must first obtain a condition for planarity analogous to the accepted test for linearity of regression in the case of two variables. The obvious course to pursue was to follow the general lines of Pearson's memoir on skew correlation.* In the notation of that paper, we have:—

$$\frac{Y_{p z_{p'}}}{\sigma_y} = b_1 + b_2 \frac{X_p}{\sigma_x} + b_3 \frac{Z_{p'}}{\sigma_2} + b_4 \frac{Z_{p'} X_p}{\sigma_x \sigma_z} + b_5 \frac{X^2{}_p}{\sigma^2{}_x} + b_6 \frac{Z^2{}_{p'}}{\sigma^2{}_z} \quad (12)$$

Multiplying by $n_{x_p z_{p'}}$ and summing for all arrays,

$$0 = \mathrm{N}b_1 + \mathrm{N}b_4 r_{xz} + \mathrm{N}b_5 + \mathrm{N}b_6. \quad \text{or } b_1 = (b_4 r_{xz} + b_5 + b_6) \qquad (13)$$

Substituting the right-hand side of (13) for b_1, multiplying by $\frac{X_p}{\sigma_x}$ summing and dividing, another constant can be substituted for, and all the constants obtained by the same orderly but wearisome process. The condition for planarity is that $b_4 = b_5 = b_6 = 0$.

The reduction can be better expressed if determinants are used. Dr. E. C. Snow (who has also been working at this problem and has kindly allowed us to see his notes) finds that the vanishing of second order terms involves the vanishing of 3 determinants each of the fifth order and containing fourth moments. He has been able to reduce the condition to the evaluation of a single third order determinant, but each constituent of the latter is itself a determinant of the third order.

It is thus clear that a test for planarity along these lines would involve a considerable amount of arithmetic. Snow, however, points out a more elegant test. Pearson in his classical memoir on Skew Correlation proved that if the regression in the case of two variables be linear $\eta^2 = r^2$ and that in all cases $(\eta^2 - r^2)\sigma^2{}_y$ is the mean square deviation of the regression curve from a straight line of closest fit.

The former statement can be verified at once.

Thus
$$\mathrm{N}\sigma_y{}^2\eta^2 = \mathrm{S}n_x(\bar{y}_{n_x} - \bar{y})^2. \qquad (14)$$

If the regression be linear, the right-hand side of (14) is—

$$\mathrm{S}n_x\left(\frac{r\sigma_y}{\sigma_x}\{x - \bar{x}\}\right)^2. = \mathrm{N}\sigma^2{}_y r^2 \qquad (15)$$

Snow defines a "solid" η (which we will call H) by—

$$\mathrm{H}^2 = \frac{\mathrm{S}_{xy} n_{xy}(\bar{z}_{n_{x'y'}} - \bar{z})^2}{\mathrm{N}\sigma^2{}_z} \qquad (16)$$

and finds that for planar regression

$$\mathrm{H}^2 = \mathrm{R}^2 = 1 - \frac{\Delta}{\Delta_{11}}$$

where
$$\Delta = \begin{vmatrix} 1, & r_{zx}, & r_{zy}, \\ r_{xz}, & 1, & r_{xy}, \\ r_{zy}, & r_{xy}, & 1, \end{vmatrix}$$

and
$$\Delta_{11} = 1 - r^2{}_{xy}.$$

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* "On the General Theory of Skew Correlation and Non-Linear Regression." *Drapers Co. Research Memoirs*, Dulau and Co., London, 1905.

This may be verified as follows :—

Substitute in (16) for $(z_{n_{x'y'}} - \bar{z})$ its value in the case of planar regression, viz. :—

$$\frac{r_{xz} - r_{xy}r_{yx}}{1 - r^2_{xy}} \cdot \frac{\sigma_z}{\sigma_x}(x' - \bar{x}) + \frac{r_{zy} - r_{xz}r_{xy}}{1 - r^2_{xy}} \cdot \frac{\sigma_z}{\sigma_y}(y' - \bar{y}) \qquad (17)$$

Multiply by σ^2_z and sum for all values of $n_{x'y'}$ (the frequency of every pair of values of x and y in the population) and we have :—

$$\begin{aligned} \mathrm{N}\sigma^2_z\mathrm{H}^2 &= \frac{\mathrm{N}\sigma^2_z}{1 - r^2_{xy}}\left\{\frac{(r_{zx} - r_{zy}r_{xy})^2 + 2r_{xy}(r_{zx} - r_{zy}r_{xy})(r_{zy} - r_{xz}r_{xy}) + (r_{zy} - r_{zx}r_{xy})^2}{1 - r^2_{xy}}\right\} \\ &= \frac{\mathrm{N}\sigma^2_z}{1 - r^2_{xy}}(r^2_{xz} + r^2_{yz} - 2r_{xy}r_{xz}r_{yz}) \\ &= \mathrm{N}\sigma^2_z\left(1 - \frac{\Delta}{\Delta_{11}}\right) \end{aligned}$$

or $\quad \mathrm{H}^2 = 1 - \frac{\Delta}{\Delta_{11}} = \mathrm{R}^2.$

R is a fairly well-known constant, and has been termed by Yule a coefficient of $(n - 1)$-fold correlation.

Its probable error (calculated by Snow) is $\frac{\cdot 67449}{\sqrt{n}} \cdot \frac{\Delta}{\Delta_{11}}$

The calculation of H is a lengthy process involving a knowledge of every cell in the cube xyz, but we believe that this is the most satisfactory method of testing for planarity of regression.

One further theoretical point arises in this connection. Assuming planarity of regression, it is easy to show that the partial correlation ratio squared, *i.e.*, the square of the average correlation ratio of y on x for all values of z, is simply ${}_zr^2_{xy}$.

What value does this take when the condition of planarity is not fulfilled ? Can we find a partial correlation ratio which plays the same part in multiple skew correlation as the ordinary ratio does in the skew correlation of two variables ?

We have devoted a good deal of time to this problem, but have failed to obtain a satisfactory result. This is probably due to the inadequacy of our mathematical technic since a statement in *Biometrika* seems to imply that a solution has been obtained and will eventually appear.* However, the results here given are possibly sufficient for the object we have in view. As will be seen later on, various empirical attempts to obtain some function of the single correlation ratios analogous to the coefficients of partial correlation were fruitless.

In order to test the validity of our ideas it was necessary to obtain sufficiently large samples of material to allow of the formation of partial correlation tables. Among the data we were actually working at for other purposes, only a single set approximated to these requirements, viz., 118 English towns of which we knew the populations and also the numbers of deaths in them from cancer and diabetes. The results of analysing this material are communicated below, but it was in any case too sparse to allow of testing the planarity of regression.

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* *Biometrika*, viii, 439.

We accordingly collected material *ad hoc*. The process adopted was to go through the report of the Registrar General for 1901, and to take out the first thousand registration subdistricts with populations between 1,000 and 10,000, together with the corresponding numbers of births and deaths. Birth and death rates were computed and the necessary correlation tables drawn up (Tables 4–9). These data were then completely analysed, and the constants deduced appear in Table 10.

We also calculated the skewness of each distribution (Table 12), and the appropriate association constants for each double array corresponding to a tabular population value (Table 15). The coefficients for these arrays are what Pearson and Heron term plural partial correlations.* Lastly we have tested by means of (16), &c., the planarity of regression in two important cases (Table 13). The extreme laboriousness of the arithmetic precluded us from applying this test to each possible regression.

In view of the fact that the thousand subdistricts included one in which, probably owing to the presence of a large hospital, the death rate was very abnormal, we recalculated the principal constants for the 999 which remained after omission of the outlying value. This has had some effect on the planarity test (Table 14), and has also emphasised the difference between the two partial coefficients.

The general impression produced by our results is as follows: The departure from planarity is decidedly more marked in the case of the indices than in that of the absolute values. We should therefore expect that ${}_zr_{xy}$ would be somewhat larger than ${}_zr_{\frac{x}{z}\frac{y}{z}}$ since if, *e.g.*, two variables a and b are as closely associated as c and d, but the regression more nearly linear in the former case, the coefficient of correlation will be greater in that case.† The expectation is realised distinctly in the case of the 999 districts. For the original thousand, however, neither value is significant having regard to its probable error. We think, therefore, that the results are consistent with a belief that the differences between ${}_zr_{xy}$ and ${}_zr_{\frac{x}{z}\frac{y}{z}}$ depend upon differences in the nature of the regression surfaces. It is worthy of note that in this particular instance ${}_zr_{xy}$ and ${}_zr_{\frac{x}{z}\frac{y}{z}}$ do not differ sufficiently for any serious divergence in interpretation to have been likely to result if the material had been used as a basis of some argument (for which purpose it is, of course, entirely unsuitable) by two statisticians, who employed respectively different constants; one $_zr_{xy}$, and the other $_zr_{\frac{x}{z}\frac{y}{z}}$.

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* We have also inserted the corresponding correlation ratios, but these, owing to the small numbers of observations and their scattered distribution, are unreliable. As a warning we also give the theoretical value of the ratio for such samples taken from an uncorrelated population (Pearson, *Biometrika*, viii, 254–6).

† It should, however, be noted that in dealing with short series showing marked variability, although the regression in the case of the indices may be less planar than in the case of the absolute numbers, ${}_zr_{\frac{x}{z}\frac{y}{z}}$ may be greater than ${}_zr_{xy}$, owing to the fact that, in the latter case, certain large values may have had great weight in determining the slope of the regression surface.

It will be noticed that the material is not nearly so variable as the ordinary series such as are met with in the previous tables. This suggests, a single trial is of course not conclusive, that when the data are numerous and the variation not very considerable, although too great to justify (2)–(5), it is a matter of indifference which coefficient is employed and that indeed no serious risk is run by calculating merely $r_{\frac{x}{z}\frac{y}{z}}$.

We attempted, as mentioned above, to obtain some empirical measure of association which should correspond to the coefficient of partial correlation and be applicable in the case of skew correlation. We cannot simply replace r by η in the ordinary expression for a coefficient of partial correlation and it is hardly correct to say that in skew correlation η plays the same part as r does in normal correlation. Each surface possesses two correlation ratios which may and often do differ considerably. The analogy is rather between η and the corresponding cofficient of regression than between η and r. This suggests that we might replace r not by one of the two correlation ratios but by their geometric mean. As will be seen from the table (Table 16) this artifice does not lead to substantially better agreement. In one case, there is an improvement, in the other the reverse.

We may deal more briefly with the analysis of the 118 towns. As will be seen from Table 17 the total correlations for the absolute values are somewhat more nearly linear than are those for the rates. The data are, however, sparse, and in any case a simple consideration of the total regressions pair and pair does not throw sufficient light upon the nature of the regression of one variable upon the other two. It is, however, worth noting that in no single case is the departure from linearity very marked and that the final agreement between $_zr_{xy}$ and $_zr_{\frac{x}{z}\frac{y}{z}}$ is quite reasonable.

The practical conclusions to be drawn from this study (which has been arithmetically far more laborious than the reader may be tempted to suppose) seem to be the following.

(1) The differences which are found to occur between $_zr_{xy}$ and $_zr_{\frac{x}{z}\frac{y}{z}}$ may be attributed to differences in the slope and form of their respective regression surfaces. These differences are due in part to the fact that in calculating $_zr_{xy}$ each observation is weighted by its actual size.

(2) In long series of observations where the variation is small the difference is not very marked, and either value may be used.

(3) In such series our experiments suggest that $_zr_{xy}$ will be generally slightly greater than $_zr_{\frac{x}{z}\frac{y}{z}}$ and the regression surfaces connecting z, y and x will deviate less markedly from planes than those of $\frac{x}{z}$ and $\frac{y}{z}$.

(4) In short series where the variation is large, of the type mostly encountered in the analysis of morbidity and mortality statistics, ${}_z r_{xy}$ and ${}_z r_{\frac{x}{z}\frac{y}{z}}$ may differ considerably.

(5) In these cases ${}_z r_{\frac{x}{z}\frac{y}{z}}$ being less influenced by wide variations in the population totals (which are always highly correlated with the absolute numbers of deaths unless we are dealing with limited outbreaks of contagious disease) is probably the better constant to use.

(6) For rough purposes, $r_{\frac{x}{z}\frac{y}{z}}$ will generally suffice owing to the usually low values of $r_{\frac{x}{z}z}$ and $r_{\frac{y}{z}z}$.

TABLE 1.—*A comparison between the correlation coefficients obtained when absolute numbers and indices are used.*

Nature of the data.	${}_z r_{xy}$.*	${}_z r_{\frac{x}{z}\frac{y}{z}}$.	$r_{\frac{x}{z}\frac{y}{z}}$.
(1) *Switzerland.*			
(*a*) Cancer and tuberculosis (crude) for 25 cantons	+ ·0697 ± ·1343	− ·1297 ± ·1326	− ·2285 ± ·1279
(*b*) Cancer and diabetes (corrected)† for 25 cantons	− ·0337 ± ·1347	− ·1533 ± ·1317	− ·1756 ± ·1307
(2) *Italy.*			
(*a*) Cancer and diabetes (corrected) for 16 provinces	+ ·1640 ± ·1641	+ ·1125 ± ·1356	+ ·3875 ± ·1433
(*b*) Cancer and diabetes (corrected) for 69 provinces	+ ·1566 ± ·0792	+ ·2151 ± ·0774	+ ·1900 ± ·0783
(3) *England.*			
(*a*) Cancer and diabetes (crude) for 118 English towns (populations, 50,000–375,000)	+ ·3892 ± ·0527	+ ·3566 ± ·0542	+ ·3561 ± ·0512
(*b*) Cancer and diabetes (corrected) for 118 English towns	+ ·1259 ± ·0611	+ ·0438 ± ·0620	+ ·0475 ± ·0619
(*c*) Cancer and diabetes (corrected by Pearson's method)‡ for 118 English towns	+ ·2461 ± ·0583	+ ·0276 ± ·0620	+ ·0285 ± ·0620
(*d*) Cancer and diabetes (crude) for 41 English counties	− ·0265 ± .1053	+ ·6334 ± ·0631	+ ·6635 ± ·0590
(*e*) Cancer and diabetes (corrected by Pearson's method)‡ for 41 English counties	− ·2752 ± ·0974	+ ·4135 ± ·0873	+ ·1272 ± ·0861
(4) *United States of America.*§			
(*a*) Cancer and diabetes (crude) for 40 American cities	+ ·6896 ± ·0559	+ ·3816 ± ·0911	+ ·3847 ± ·0909
(*b*) Cancer and diabetes (corrected) for 40 American cities	+ ·7325 ± ·0494	+ ·6602 ± ·0602	+ ·6817 ± ·0571
(*c*) Cancer and diabetes (corrected) for 33 American cities (omitting all cities of over 500,000 inhabitants)	+ ·8635 ± ·0299	+ ·7415 ± ·0529	+ ·6572 ± ·0667

* Where z = population and x and y deaths from the two diseases.

† Corrected for age-distribution by the ordinary method.

‡ See "On the Correlation of Death-Rates," by Karl Pearson, F.R.S., assisted by Alice Lee, D.Sc., and Ethel M. Elderton, Galton Research Scholar. *Journal of the Royal Statistical Society*, vol. 73, p. 534. The correlations given above are :—${}_{cf}\,{}_z r_{xy}$, ${}_{cf}\,{}_z r_{\frac{x}{z}\frac{y}{z}}$ and ${}_{cf} r_{\frac{x}{z}\frac{y}{z}}$, where cf = corrective factor.

§ Some of the coefficients of correlation as well as data for the calculation of others were obtained from a paper by G. D. Maynard, F.R.C.S.E., entitled "A Statistical Study in Cancer Death Rates," in *Biometrika*, vol. vii, p. 276.

TABLE 2.

x	y	z
5	7	100
10	14	150
15	16	180
20	18	200
25	21	250
30	30	300

These give :—

$r_{xy} = {\cdot}96306$, $r_{xz} = {\cdot}99124$, $r_{yz} = {\cdot}98435$, ${}_zr_{xy} = -{\cdot}54411$.

$r_{\frac{x}{z}\frac{y}{z}} = {\cdot}63273$, $r_{\frac{x}{z}z} = {\cdot}88852$, $r_{\frac{y}{z}z} = {\cdot}69366$, ${}_zr_{\frac{x}{z}\frac{y}{z}} = +{\cdot}04962$.

adding to the above :—

x	y	z
260	250	3000

we obtain :—

$r_{xy} = {\cdot}99364$, $r_{xz} = {\cdot}99945$, $r_{yz} = {\cdot}99976$, ${}_zr_{xy} = +{\cdot}58912$.

$r_{\frac{x}{z}\frac{y}{z}} = {\cdot}99870$, $r_{\frac{x}{z}z} = {\cdot}99955$, $r_{\frac{y}{z}z} = {\cdot}99898$, ${}_zr_{\frac{x}{z}\frac{y}{z}} = +{\cdot}12644$.

TABLE 3.—*Table showing the effect of the presence of large cities upon the coefficient correlation when absolute numbers and indices are used.*

Nature of the data.	Correlations for							
	Absolute numbers.				Indices.			
	r_{xy}	r_{xz}	r_{yz}	${}_zr_{xy}$	$r_{\frac{x}{z}\frac{y}{z}}$	$r_{\frac{x}{z}z}$	$r_{\frac{y}{z}z}$	${}_zr_{\frac{x}{z}\frac{y}{z}}$
Correlation between deaths from cancer and diabetes (corrected) for 40 American cities :—†								
(1) Original values..............	+ ·9712 ± ·0061	+ ·9898 ± ·0022	+ ·9474 ± ·0109	+ ·7325 ± ·0494	+ ·6842 ± ·0573	+ ·3511 ± ·0935	+ ·2263 ± ·1012	+ ·6558 ± ·0604
(2) With the addition of an imaginary observation with z=3,740,000, and with mean cancer and diabetes death-rates	+ ·9827 ± ·0036	+ ·9913 ± ·0018	+ ·9631 ± ·0076	+ ·7883 ± ·0390	+ ·6842 ± ·0573	− ·2284 ± ·0998	+ ·1476 ± ·1030	+ ·6714 ± ·0579
(3) With the addition of an imaginary observation with z=3,740,000, but with highest cancer death-rate and lowest diabetes death-rate found among the 40 original cities.........	+ ·7846 ± ·0405	+ ·9833 ± ·0035	+ ·8539 ± ·0285	− ·5808 ± ·0698	+ ·4639 ± ·0837	+ ·5652 ± ·0727	− ·0373 ± ·1052	+ ·5884 ± ·0689
Correlation between deaths from cancer and diabetes (crude) for English counties :—								
(1) 32 rural and semi-rural counties	+ ·9662 ± ·0079	+ ·9517 ± ·0112	+ ·8973 ± ·0232	+ ·8286 ± ·0274	− ·6600 ± ·0673	− ·6151 ± ·0741	− ·5617 ± ·0816	+ ·1821 ± ·0915
(2) With the addition of nine urban counties of which three have very large populations‡	+ ·9741 ± ·0054	+ ·9852 ± ·0031	+ ·9895 ± ·0022	− ·0265 ± ·1053	+ ·6635 ± ·0590	− ·2655 ± ·0979	− ·3197 ± ·0946	+ ·6334 ± ·0631

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* Where z = population, x = number of deaths from cancer, and y = number of deaths from diabetes.

† See "A Statistical Study in Cancer Death-rates," by G. D. Maynard, F.R.C.S.E., Pretoria. *Biometrika*, vol. vii, p. 276.

‡ See note ‡ on next page.

TABLE 3 *Contd.—Showing effect of presence of large values upon coefficient of correlation.*

Nature of the data.	Means and standard deviations.								Mean population.	S.D. population.
	Absolute numbers.				Indices.					
	Mean x.	σ_x	Mean y.	σ_y	Mean $\frac{x}{z}$[*]	$\sigma_{\frac{x}{z}}$[*]	Mean $\frac{y}{z}$[*]	$\sigma_{\frac{y}{z}}$		
Correlation between deaths from cancer and diabetes (corrected) for 40 American cities :—[†]										
(1) Original values	294·29	390·36	42·857	63·513	732·63	128·67	105·85	32·152	374,000	119,240
(2) With the addition of an imaginary observation with $z = 3,740,000$, and with mean cancer and diabetes death-rates	353·95	539·43	51·168	83·074	732·63	127·09	105·85	31·757	456,098	683,007
(3) With the addition of an imaginary observation with $z = 3,740,000$, but with highest cancer death-rate and lowest diabetes death-rate found among the 40 original cities	395·12	745·16	46·829	67·576	743·63	144·92	104·61	32·712	456,098	683,007
Correlation between deaths from cancer and diabetes (crude) for English counties :										
(1) 32 rural and semi-rural counties	192·77	111·72	26·229	14·403	898·91	132·70	123·28	22·456	228,488	151,172
(2) With the addition of the nine urban counties of which three have very large populations[‡]	313·97	406·61	41·984	50·711	870·45	138·94	118·98	21·811	380,844	475,036

[*] Death-rate per 1,000,000 living.

[†] See "A Statistical Study in Cancer Death rates," by G. D. Maynard, F.R.C.S.E., Pretoria. *Biometrika*, vol. vii, p. 276.

[‡]

	Population. Males.	Cancer death-rate per 1,000,000.	Diabetes death-rate per 1,000,000.
London	2,131,900	1,033	107
Lancashire	2,242,500	727	107
West Riding of Yorkshire	1,427,100	748	120

TABLE 4.—*Correlation table: Births and population.* (1,000 *English registration sub-districts.*)

Population Groups.	Births.																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100	100–110	110–120	120–130	130–140	140–150	150–160	160–170	170–180	180–190	190–200	200–210
1,000– 1,500 ..	2·5	10	11·5	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1,500– 2,000 ..	..	4·5	11·5	19·5	4	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2,000– 2,500 ..	..	..	4	25·5	23·5	11·5	3	..	..	..	..	..	..	..	..	..	..	..	..	..
2,500– 3,000 ..	..	..	..	2·5	16·5	32·5	11·5	7·5	2	1	..	..	..	..	..	..	..	..	..	..
3,000– 3,500 ..	..	..	..	..	5·5	19·5	25·5	25·5	15	3·5	1	..	..	..	..	..	..	..	..	..
3,500– 4,000 ..	..	..	..	..	..	7	20·5	20·5	22	13	3	3	..	..	..	..	..	..	..	..
4,000– 4,500 ..	..	..	..	..	..	1	1	12	21	15	13	3	..	..	..	..	..	..	..	..
4,500– 5,000 ..	..	..	..	..	..	..	..	2	10·5	9·5	17	8·5	3·5	3	1	..	..	..	..	..
5,000– 5,500 ..	..	..	..	..	..	..	..	1	2·5	6·5	9·5	22·5	11	7	5	3	..	..	..	..
5,500– 6,000 ..	..	..	..	..	..	..	..	..	1	3	4	11	18·5	10	6·5	7	..	2	..	1
6,000– 6,500 ..	..	..	..	1	..	..	..	..	..	2·5	2	1·5	12	11	8	7·5	4	2·5	2·5	1
6,500– 7,000 ..	..	..	..	..	..	..	..	..	..	·5	1	1·5	2	6	6·5	11·5	5	4·5	3	3
7,000– 7,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	3	6	7	7	10·5	3·5
7,500– 8,000 ..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	3·5	5·5	10	8·5	8
8,000– 8,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	·5	·5	1·5	2·5	5	4	6·5
8,500– 9,000 ..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	2·5	4	4·5	6·5
9,000– 9,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	3	3·5
9,500–10,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	2	1·5
Total ..	2·5	11·5	27	49·5	49·5	71·5	64·5	68·5	77	54·5	51·5	52	47	41·5	31·5	43	28·5	36	38	31·5

TABLE 4.—*Correlation table: Births and population. (1,000 English registration sub-districts.)—Contd.*

Population Groups.	Births.																Total Frequency.
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
	210–220	220–230	230–240	240–250	250–260	260–270	270–280	280–290	290–300	300–310	310–320	320–330	330–340	340–350	350–360	360–370	
1,000– 1,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25
1,500– 2,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	41·5
2,000– 2,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	67·5
2,500– 3,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	76·5
3,000– 3,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	95·5
3,500– 4,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	89
4,000– 4,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	69
4,500– 5,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	55
5,000– 5,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	68
5,500– 6,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	64
6,000– 6,500 ..	2	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	58·5
6,500– 7,000 ..	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	47·5
7,000– 7,500 ..	2·5	3·5	·5	·5	..	..	..	..	..	..	..	..	..	1	..	..	49
7,500– 8,000 ..	3·5	5	1	3	1	1	..	..	..	..	..	..	..	..	..	..	52
8,000– 8,500 ..	6·5	6·5	1·5	2	2	..	2	1	..	..	..	..	..	..	..	..	45
8,500– 9,000 ..	6	4	1·5	3·5	1·5	1	..	..	2	1	..	..	..	..	..	1	41
9,000– 9,500 ..	2·5	5·5	7	3	1	1·5	1	1	..	..	..	..	..	..	..	..	31
9,500–10,000 ..	2·5	2	2·5	4·5	2	3·5	1·5	1	..	..	..	1	..	..	..	..	25
Total ..	26·5	27·5	14	17·5	7·5	7	5·5	3	2	1	—	1	—	1	—	1	1,000

TABLE 5.—*Correlation table: Deaths and population.* (1,000 *English registration sub-districts.*)

Population. Groups.	Deaths.														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100	100–110	110–120	120–130	130–140	140–150
1,000– 1,500 ..	1·5	20	3·5	..	..	..	..	..	..	..	..	..	..	..	..
1,500– 2,000 ..	..	8·5	28·5	4·5	..	..	..	..	..	..	..	..	..	..	..
2,000– 2,500 ..	..	5	37	19	6	·5	..	..	..	..	..	..	..	..	..
2,500– 3,000 ..	..	·5	11	32·5	24·5	8	..	..	..	..	..	..	..	..	..
3,000– 3,500 ..	..	..	2·5	26·5	44·5	19	3	..	..	..	..	..	..	..	..
3,500– 4,000 ..	..	..	2·5	7·5	30·5	29·5	11	6	1	1	..	..	..	..	..
4,000– 4,500 ..	..	..	..	1	14·5	17·5	24·5	9	·5	1	..	..	..	..	..
4,500– 5,000 ..	..	..	..	..	5·5	12·5	22	9	2·5	2·5	..	..	..	..	1
5,000– 5,500 ..	..	..	..	..	1·5	9	17	21	8·5	6	2·5	·5	..	..	1
5,500– 6,000 ..	..	..	..	..	·5	1·5	7	23·5	9	16·5	3	..	..	1	..
6,000– 6,500 ..	..	..	..	..	..	2	4	5	18·5	13·5	10·5	1·5	·5	1	1
6,500– 7,000 ..	..	..	..	..	..	..	1	7	4·5	13·5	9	7·5	2	1	..
7,000– 7,500 ..	..	..	..	..	..	..	1	3	7	12	11·5	5·5	4	1·5	1·5
7,500– 8,000 ..	..	..	..	..	..	..	..	2·5	2	8	11	14	7·5	2·5	·5
8,000– 8,500 ..	..	..	..	..	..	..	..	1	..	3	10	12·5	7·5	5	1
8,500– 9,000 ..	..	..	..	..	..	..	..	..	1	4	2·5	4	10	4·5	6·5
9,000– 9,500 ..	..	..	..	..	..	..	..	..	1	2	5	1	7	8·5	1·5
9,500–10,000 ..	..	..	..	..	..	..	..	..	..	1	1	2·5	3·5	2	8
Total ..	1·5	34	85	91	127·5	99·5	90·5	87	55·5	84	66	49	42	27	22

TABLE 5.—*Correlation table: Deaths and population.* (1,000 *English registration sub-districts.*)—*Contd.*

Population Groups.	Deaths.														Total Frequency.
	16	17	18	19	20	21	22–29	30	31–33	34	35–38	39	40–74	75	
	150–160	160–170	170–180	180–190	190–200	200–210	210–290	290–300	300–330	330–340	340–380	380–390	390–740	740–750	
1,000– 1,500 ..	..	..	..	..	..	..	..	..	..	..	..		..	..	25
1,500– 2,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	41·5
2,000– 2,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	67·5
2,500– 3,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	76·5
3,000– 3,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	95·5
3,500– 4,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	89
4,000– 4,500 ..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	69
4,500– 5,000 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	55
5,000– 5,500 ..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	68
5,500– 6,000 ..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	64
6,000– 6,500 ..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	58·5
6 500– 7,000 ..	..	..	..	·5	·5	1	..	..	..	..	..	..	..	..	47·5
7,000– 7,500 ..	..	1	·5	·5	..	..	..	..	..	..	..	..	..	..	49
7,500– 8,000 ..	..	2	..	..	1	..	..	..	..	..	..	..	..	1	52
8,000– 8,500 ..	1	1	1	..	..	1	..	..	..	..	..	1	..	..	45
8,500– 9,000 ..	2·5	2	1	1	1	..	..	..	..	1	..	..	..	..	41
9,000– 9,500 ..	3	..	1	1	..	..	..	..	..	..	..	..	..	..	31
9,500–10,000 ..	1	2	2	·5	·5	..	..	1	..	..	..	..	..	..	25
Total ..	9·5	9	6·5	3·5	4	2	—	1	—	1	—	1	—	1	1,000

TABLE 6.—*Correlation table: Births and deaths.* (1,000 *English registration sub-districts.*)

Births.	Deaths.														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100	100–110	110–120	120–130	130–140	140–150
10– 20 ..	..	2·5	..	..	..	..	..	..	..	..	..	..	..	..	..
20– 30 ..	..	8	6	·5	..	..	..	..	..	..	..	..	..	..	..
30– 40 ..	1·5	14·5	8·5	·5	1·5	·5	..	..	..	..	..	..	..	..	..
40– 50 ..	..	5·75	27·25	12	3·5	..	..	..	..	..	..	..	..	..	..
50– 60 ..	..	1·75	21·75	16	9	1	..	..	..	..	..	..	..	..	..
60– 70 ..	..	1·5	16	23	20	9	3	1	..	1	..	..	..	..	..
70– 80 ..	..	..	1·5	18·75	25·25	13	3	3	..	..	..	..	..	..	..
80– 90 ..	..	..	3·5	14·25	26·75	12·5	5·5	4	·5	·5	..	..	..	..	..
90–100 ..	..	..	·5	4	22	21	17	6	1	3·5	..	..	..	..	1
100–110 ..	..	..	..	2	13·5	16	12	4	2	4	1	..	..	..	..
110–120 ..	..	..	..	..	3	12·75	17·75	7·5	3·5	5	..	..	..	..	1
120–130 ..	..	..	..	..	2·5	6·25	14·25	16·5	7·5	4	..	..	..	1	..
130–140 ..	..	..	..	..	·5	2·5	9	14·5	7·5	9	3	..	..	..	..
140–150 ..	..	..	..	..	..	4	2·5	9·5	7	8	7·5	1	..	1	..
150–160 ..	..	..	..	..	..	..	3·5	6·5	6·5	3	2·75	3·25	1	..	1
160–170 ..	..	..	..	..	..	1	2	6	3	11·5	12·25	3·25	3	..	..
170–180 ..	..	..	..	..	..	..	..	3	2·5	6·25	5·25	6·5	2	..	..
180–190 ..	..	..	..	..	..	..	..	2	4·5	9·75	5·25	6	6·25	2·25	..
190–200 ..	..	..	..	..	..	..	1	·5	6	5	4·25	8·25	4·75	3	5·25
200–210 ..	..	..	..	..	..	..	..	2	2	6	7·75	7·25	3	2·25	1·75
210–220 ..	..	..	..	..	..	..	..	..	1	2·5	6·5	1	7	2·5	2·5
220–230 ..	..	..	..	..	..	..	..	1	..	2	3·5	4	4·5	5·5	2·5
230–240 ..	..	..	..	..	..	..	..	..	..	1	5	·5	1	2	1
240–250 ..	..	..	..	..	..	..	..	..	1	1	1·5	3·5	4	1	4·5
250–260 ..	..	..	..	..	..	..	..	..	..	..	·5	1·5	2	..	·5
260–270 ..	..	..	..	..	..	..	..	..	..	1	..	2	..	1·5	1
270–280 ..	..	..	..	..	..	..	..	..	..	..	..	1	..	2·5	..
280–290 ..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..
290–300 ..	..	..	..	..	..	..	..	..	..	..	..	..	·5	1·5	..
300–310 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
310–320 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
320–330 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
330–340 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
340–350 ..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
350–360 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
360–370 ..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Total ..	1·5	34	85	91	127·5	99·5	90·5	87	55·5	84	66	49	42	27	22

TABLE 6.—*Correlation table: Births and deaths. (1,000 English registration sub-districts.)—Contd.*

Births.		Deaths.														Total Frequency.
		16	17	18	19	20	21	22–29	30	31–33	34	35–38	39	40–74	75	
		150–160	160–170	170–180	180–190	190–200	200–210	210–290	290–300	300–330	330–340	340–380	380–390	390–740	740–750	
10– 20 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2·5
20– 30 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14·5
30– 40 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	27
40– 50 ..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	49·5
50– 60 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	49·5
60– 70 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	74·5
70– 80 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	64·5
80– 90 ..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	68·5
90–100 ..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	77
100–110 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	54·5
110–120 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	51·5
120–130 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	52
130–140 ..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	47
140–150 ..	..	..	..	·5	·5	..	..	..	..	..	..	..	..	..	..	41·5
150–160 ..	..	..	1	..	·5	1·5	..	..	..	..	1	..	..	..	..	31·5
160–170 ..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	43
170–180 ..	..	1	2	..	..	..	..	..	..	..	..	..	..	..	..	28·5
180–190 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	36
190–200 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	38
200–210 ..	..	..	·5	1	1	..	..	..	..	..	..	..	..	..	..	34·5
210–220 ..	..	1	2·5	..	..	..	..	..	..	..	..	..	..	..	..	26·5
220–230 ..	..	..	1·5	1	..	1	1	..	..	..	..	..	..	..	..	27·5
230–240 ..	..	2	·5	..	·5	·5	..	..	..	..	..	..	..	..	..	14
240–250 ..	..	..	..	..	·5	·5	..	..	..	..	..	..	..	..	..	17·5
250–260 ..	..	·5	..	1·5	·5	·5	..	..	..	..	..	..	..	..	..	7·5
260–270 ..	..	1	..	·5	..	..	..	..	..	..	..	..	..	..	..	7
270–280 ..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	5·5
280–290 ..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	3
290–300 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
300–310 ..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1
310–320 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
320–330 ..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1
330–340 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
340–350 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
350–360 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
360–370 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Total	..	9·5	9	6·5	3·5	4	2	—	1	—	1	—	1	—	1	1,000

TABLE 7.—*Correlation table: Birth rates and population.* (1,000 *English registration sub-districts.*)

Population Groups.	Birth Rates.																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	70–80	80–90	90–100	100–110	110–120	120–130	130–140	140–150	150–160	160–170	170–180	180–190	190–200	200–210	210–220	220–230	230–240	240–250	250–260	260–270	270–280	280–290	290–300
1,000– 1,500	..	..	..	..	..	..	..	..	1	2	1	..	2	1	2	3	2·5	1·5	2	..	1·5	1·5	1
1,500– 2,000	..	..	..	..	..	..	..	1	..	1	..	5	2·5	1·5	2	4	6	6	4	2	1·25	·25	1
2,000– 2,500	..	..	..	..	..	..	..	..	2	·5	2·5	4	6	6	6·5	5·5	6	6	6	3	2·25	3·75	1·5
2,500– 3,000	..	..	..	..	..	..	..	..	..	1	2	1	3	8·5	10	4·5	7·5	11·75	4·25	7·5	6·5	2	2
3,000– 3,500	..	..	..	..	..	..	..	..	..	..	1	4	4	5·5	7·5	12	12	10·25	9·25	8·5	8	4·5	5
3,500– 4,000	..	..	..	..	..	..	..	..	..	2	3	3	6	9	9	10	8	8·5	5·5	11	4	2	3
4,000– 4,500	..	..	..	..	..	..	..	..	..	1	..	2	3	5	8	13·5	8	5·5	8	8	4	..	3
4,500– 5,000	..	..	..	..	..	..	..	..	..	..	1	2·5	4·5	3	5·5	5·5	5·5	11	5·5	3	2·5	1·5	1
5,000– 5,500	..	..	..	..	..	..	..	..	..	1	..	..	4	4	6·5	7	9	14·5	7·5	4·5	2·5	5·5	2
5,500– 6,000	..	..	..	..	..	..	..	..	..	1	2	1	1	2	4·5	10	11·5	11	2	7	4	1	3
6,000– 6,500	1	..	..	..	..	..	..	..	..	..	2	2	1	3	5	8·5	7·5	4	6	3·5	5	·5	1·5
6,500– 7,000	..	..	..	..	..	..	..	..	1	..	..	1	2	1·5	2·5	7	4	8·5	3·5	4·5	2	3	1
7,000– 7,500	..	..	..	..	..	..	..	..	..	..	..	..	..	3·5	·5	5·5	7	4	8·5	5	5·5	1·5	1·5
7,500– 8,000	..	..	..	..	..	..	..	1	1	..	..	..	..	..	3·5	5·5	5	7·5	7·5	7	4·5	·5	3
8,000– 8,500	..	..	..	..	..	..	..	..	..	..	..	1	1	4	3	4	1	4	6·5	4·5	4·5	·5	3
8,500– 9,000	1	..	..	..	..	..	..	..	..	..	1	..	1	2	6	2	6·5	5·5	4	2	2	2	1
9,000– 9,500	..	..	..	..	..	..	..	..	..	..	..	..	2	..	5	3	1·5	6·5	7	2	..	2	1
9,500–10,000	..	..	..	..	..	..	..	..	..	..	1	..	·5	1·5	3	2	1	1·5	2·5	4·5	2·5	..	..
Total	2	—	—	—	—	—	—	2	5	9·5	16·5	26·5	43·5	61	90	112·5	112·5	127·5	99·5	87·5	62·5	32·0	34·5

TABLE 7.—*Correlation table: Birth rates and population.* (1,000 *English registration sub-districts*).—*Contd.*

Population Groups.	Birth Rates.																				Total Frequency.
	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	
	300–310	310–320	320–330	330–340	340–350	350–360	360–370	370–380	380–390	390–400	400–410	410–420	420–430	430–440	440–450	450–460	460–470	470–480	480–490	490–500	
1,000– 1,500 ..	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25
1,500– 2,000 ..	1	1	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	41·5
2,000– 2,500 ..	2	3	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	67·5
2,500– 3,000 ..	2·5	·5	1	..	·5	·5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	76·5
3,000– 3,500 ..	2	1	..	·5	·5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	95·5
3,500– 4,000 ..	1·5	3·5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	89
4,000– 4,500 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	69
4,500– 5,000 ..	1·5	1·5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	55
5,000– 5,500 ..	·5	2·5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	68
5,500– 6,000 ..	..	1	1	..	·5	·5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	64
6,000– 6,500 ..	3	1	..	2	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	58·5
6,500– 7,000 ..	2·5	·5	2	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	47·5
7,000– 7,500 ..	2	2·5	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	49
7,500– 8,000 ..	..	2	2	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	52
8,000– 8,500 ..	1	1	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	45
8,500– 9,000 ..	1	..	..	1	2	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	41
9,000– 9,500 ..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	31
9,500–10,000 ..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25
Total ..	22·5	23	10	5·5	7·5	3	—	—	—	2	—	1	—	—	—	—	—	—	—	1	1,000

TABLE 8.—*Correlation table: Death rates and population.* (1,000 *English registration sub-districts.*)

Population Groups.	Death Rates.																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	60–70	70–80	80–90	90–100	100–110	110–120	120–130	130–140	140–150	150–160	160–170	170–180	180–190	190–200	200–210	210–220	220–230	230–240	240–250
1,000– 1,500..	..	2	2·5	2·5	2	2	1	2	6	3	..	..	1·5	·5	..	..	..	..	..
1,500– 2,000..	..	2	..	2	2·5	5	6	6	5	4	3	1	3	2	..	..	..	..	..
2,000– 2,500..	1·5	·5	2·5	3·5	8	7·5	12·5	12	5·5	1	5	2	1·5	2·5	..	1	1	..	..
2,500– 3,000..	..	1	1·5	3·5	3	6·5	11·5	11	9·75	12·25	7·5	3	1	3	1	1	..	..	..
3,000– 3,500..	..	2	..	1·5	5·5	14·5	13	18·5	11·25	9·25	7·5	6·5	2	..	..	1	..	..	..
3,500– 4,000..	1	1	2	4·5	2·5	13·5	15	14	12	7·5	3	4·5	2·5	3	1	..	1	..	..
4,000– 4,500..	..	..	1	1	6	7·5	10·5	5·5	11	10·5	6·5	4·5	3	..	..	1	..	..	..
4,500– 5,000..	..	..	1	1	4	10	7	9·5	6	8·5	2·5	1·5	2	..	1	..	..	..	..
5,000– 5,500..	..	..	1	2	3	6	9·5	13·5	9	9	5	3	2	..	3	..	..	..	..
5,500– 6,000..	..	..	·5	1·5	2	3·5	9	16	6·5	7·5	9	5·5	..	..	..	..	..	..	1
6,000– 6,500..	..	..	2	..	4	..	7·5	13·5	9	7·5	6·5	4	·5	1	..	..	1	1	..
6,500– 7,000..	..	..	..	1	1·5	7·5	2	4·5	7	9	9	1	1·5	·5	..	1	..	..	..
7,000– 7,500..	..	..	..	1	3	5	6	10	7	6·5	1·5	3	3	1	..	..	1	..	..
7,500– 8,000..	..	..	..	·5	3·5	3	5	8	15·5	4·5	7	..	1	..	1	1	..	..	..
8,000– 8,500..	..	..	..	1	·5	1·5	6·5	9	12	6·5	2·5	·5	1	..	1	1	..	.	..
8,500– 9,000..	..	..	..	1	3·5	1·5	2·5	6·5	7	5	3·5	3·5	2	2	1	1	..		..
9,000– 9,500..	..	..	..	1	3	4	2	6·5	6	3·5	3	..	1	..	1	..	..	..	..
9,500–10,000..	..	..	..	1	1	1	3	4	7·5	1·5	1	2	1	1	..	..	..	..	..
Total ..	2·5	8·5	14	32·5	58·5	99·5	129·5	170	153	116·5	83	45·5	29·5	16·5	10	8	1	1	1

TABLE 8.—*Correlation table; Death rates and population. (1,000 English registration sub-districts).—Contd.*

Population Groups.	Death Rates.																	Total Frequency.
	20	21	22	23	24	25	26–27	28	29	30	31–32	33	34	35–41	42	43–88	89	
	250–260	260–270	270–280	280–290	290–300	300–310	310–330	330–340	340–350	350–360	360–380	380–390	390–400	400–470	470–480	480–940	940–950	
1,000– 1,500..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25
1,500– 2,000..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	41·5
2,000– 2,500..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	67·5
2,500– 3,000..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	76·5
3,000– 3,500..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	95·5
3,500– 4,000..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	89
4,000– 4,500..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	69
4,500– 5,000..	..	..	..	·5	·5	..	..	..	..	..	..	..	..	..	..	..	..	55
5,000– 5,500..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	68
5,500– 6,000..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	64
6,000– 6,500..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	58·5
6,500– 7,000..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	47·5
7,000– 7,500..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	49
7,500– 8,000..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	52
8,000– 8,500..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	45
8,500– 9,000..	..	..	..	..	..	..	..	..	..	..	..	·5	·5	..	..	..	..	41
9,000– 9,500..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	31
9,500–10,000..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	25
Total ..	3	1	2	2·5	2·5	1	—	1	—	1	—	·5	·5	—	1	—	1	1,000

TABLE 9.—*Correlation table: Birth rates and death rates.* (1,000 *English registration sub-districts.*)

Birth Rates.	Death Rates.																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	60–70	70–80	80–90	90–100	100–110	110–120	120–130	130–140	140–150	150–160	160–170	170–180	180–190	190–200	200–210	210–220	220–230	230–240	240–250	250–260
70– 80	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
80–140	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
140–150	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
150–160	..	..	..	·5	·5	..	..	·5	·5	..	..	..	1	1	..	..	1	..	..	..
160–170	..	..	·5	·5	..	2	2	·5	1	1	..	..	..	1	..	..	..	..	..	..
170–180	..	..	..	..	1	1	1	4	1·5	3	1	3	..	..	..	..	..	..	..	..
180–190	..	2	2·5	2·5	3·5	2·5	2·5	3	4·5	1·5	..	..	1	1	..	..	..	..	..	..
190–200	..	..	..	2·5	2	2	9	6·5	6·5	5·5	2·5	2	1	1	2	..	..	..	..	..
200–210	..	..	1·5	6	6	6	11·5	7·5	4·5	2·5	6	1	3·5	1	..	2·5	..	..	..	1·5
210–220	..	1	2	2·5	4·75	12·75	15·25	10·75	13·5	12	6·5	3·5	·5	2	..	1·5	..	..	..	·5
220–230	..	1	1·5	3	5·75	13·75	15·75	16·75	21·25	12·25	6·25	5·75	2·5	1	1	1	1	..	1	..
230–240	2	..	2	3·5	8	10·5	11·75	24·5	14·5	15·25	9·25	4·25	3	2	..	..	1	..	..	..
240–250	·25	1·25	1	2·5	7	14	18	21·25	17·5	12·25	14·5	12·5	2	2·5	1	..	..	..	..	..
250–260	·25	2·25	..	4	6·5	14	10·75	14·75	19	8·5	12·5	2·5	2	1	·5	..	..	1	..	..
260–270	..	1	1	2	3·5	7	11·75	19·5	16	10·75	3·75	·25	4·5	2	2·5	..	..	..	..	..
270–280	..	..	..	3	5·5	4·5	10·75	11	8·75	6·5	5·25	3·25	·5	..	2	·5	1	..	..	..
280–290	..	..	1	..	·5	4	2·5	4	5·5	5	4	..	3	..	1	1·5	..	..	..	..
290–300	..	..	..	..	1	1	3	10	6·5	4·5	3·5	3	1	..	..	..	..	..	..	1
300–310	..	..	..	..	2	1·5	..	3·5	5	4·5	2	2	1	..	..	1	..	..	..	..
310–320	..	..	..	..	..	2·5	2	5·5	4·5	4	2	1·5	..	1	..	..	..	..	..	..
320–330	..	..	1	..	..	..	..	2	·5	4·5	..	..	..	..	..	..	..	..	..	..
330–340	..	..	..	..	..	..	..	2	1	1	1·5	..	..	..	..	..	..	..	..	..
340–350	..	..	..	..	..	·25	1·75	·5	..	1·5	1·5	1	..	..	..	..	..	..	..	..
350–360	..	..	..	..	..	·25	·25	..	..	·5	..	..	2	..	..	..	..	..	..	..
360–370	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
370–380	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
380–390	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
390–400	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..
400–410	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
410–420	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
420–490	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
490–500	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
Total	2·5	8·5	14	32·5	58·5	99·5	129·5	170	153	116·5	83	45·5	29·5	16·5	10	8	4	1	1	3

TABLE 9.—*Correlation table: Birth rates and death rates.* (1,000 *English registration sub-districts.*)—*Contd.*

Birth Rates.	Death Rates.																									Total Frequency.
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43–88	89	90	
	260–270	270–280	280–290	290–300	300–310	310–320	320–330	330–340	340–350	350–360	360–370	370–380	380–390	390–400	400–410	410–420	420–430	430–440	440–450	450–460	460–470	470–480	480–940	940–950	950–960	
70– 80	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
80–140	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
140–150	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	2
150–160	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5
160–170	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9·5
170–180	..	..	..	..	..	..	..	..	..	..	..	..	·5	·5	..	..	..	..	..	..	..	..	..	..	..	16·5
180–190	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	26·5
190–200	..	..	·5	·5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	43·5
200–210	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	61
210–220	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	90
220–230	..	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	112·5
230–240	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	112·5
240–250	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	127·5
250–260	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	99·5
260–270	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	87·5
270–280	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	62·5
280–290	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	32
290–300	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	31·5
300–310	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	22·5
310–320	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	23
320–330	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10
330–340	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5·5
340–350	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	7·5
350–360	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3
360–370	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
370–380	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
380–390	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
390–400	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
400–410	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
410–420	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
420–490	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
490–500	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Total ..	1	2	2·5	2·5	1	—	—	1	—	1	—	—	·5	·5	—	—	—	—	—	—	—	1	—	1	—	1,000

TABLE 10.—1,000 *English registration sub-districts.**

Rates—

	Means and standard deviations.
Mean birth-rate	24·3495 per 1,000 popn.
S.D. ,,	3·8539
Mean death-rate	14·3360 per 1,000 popn.
S.D. ,,	4·2851
Mean population	5094·7500
S.D. ,,	2290·5834

Correlation—

	r.	*η*.	Geometric mean.	Linearity test.†
B.R. and population	·1375 ± ·0209	·1871 ·2281	·2066	2·974 4·266
D.R. and population	·1478 ± ·0209	·1862 ·2514	·2164	2·654 4·768
B.R. and D.R.	− ·0152 ± ·0213	·4581 ·2576	·3435	10·733 6·028

Partial correlation—

B.R. and popn. : D.R. const.	·1413 ± ·0209
D.R. and popn. : D.R. const.	·1514 ± ·0209
B.R. and D.R. : popn. const.	− ·0363 ± ·0213

Absolute numbers—

	Means		Standard deviations
Mean births	125·255	S.D.	62·6625
Mean deaths	74·485	S.D.	46·1691
Mean population	5094·7500	S.D.	2290·5834

Correlation—

	r.	*η*.	Geometric mean.	Linearity test.†
Births and popn.	·9345 ± ·0027	·9358 ·9501	·9429	1·154 4·469
Deaths and popn.	·7822 ± ·0083	·7855 ·9241	·8520	1·692 11·534
Births and deaths	·7333 ± ·0097	·8871 ·7527	·8171	11·538 3·401
Partial correlation—				
Births and popn.: deaths const.	·8521 ± ·0058			
Deaths and popn.: births const.	·4003 ± ·0179			
Births and deaths: popn. const.	·0106 ± ·0213			

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* The above Table includes one sub-district with death-rate 94·3 per 1,000 the corresponding birth-rate being 14·6 per 1,000. In Table 11 will be found the correlations omitting this extreme case.

† See Table 15.

TABLE 11.—999 *English registration sub-districts.*

Rates—

	Means and standard deviations.
Mean birth-rate	24·3594 per 1,000 popn.
S.D. "	3·8432
Mean death-rate	14·2558 per 1,000 popn.
S.D. "	3·4556
Mean population	5092·0921
S.D. "	2290·1878

Correlation—

	r.	η.	Geometric mean.	Linearity test.*
B.R. and population	·1411 ± ·0209	·2330 ·1885	·2095	4·347 2·930
D.R. and population	·1566 ± ·0208	·1988 ·2489	·2225	2·871 4·535
B.R. and D.R.	·0785 ± ·0212	·2425 ·2454	·2439	5·379 5·450

Partial correlation—

	r.
B.R. and popn.: D.R. const.	·1308 ± ·0209
D.R. and popn.: B.R. const.	·1474 ± ·0210
B.R. and D.R.: popn. const.	·0577 ± ·0213

Absolute numbers—

	Means and standard deviations.
Mean births	125·2653
S.D. "	62·6930
Mean deaths	73·8138
S.D. "	41·0272
Mean population	5092·0921
S.D. "	2290·1878

Correlation—

	r.	η.	Geometric mean.	Linearity test.*
Births and population	·9354 ± ·0027	·9368 ·9509	·9438	1·200 4·008
Deaths and population	·8622 ± ·0055	·8646 ·9240	·8938	1·509 7·788
Births and deaths	·8283 ± ·0067	·8871 ·8469	·8667	7·445 4·138

Partial correlation—

Births and population: deaths const.	·7793 ± ·0084
Deaths and population: births const.	·4414 ± ·0172
Births and deaths: popn. const.	·1218 ± ·0210

* See Table 15.

TABLE 12.—*The curve-fitting constants* (1,000 *sub-districts*).

	μ_2.	μ_3.	μ_4.	β_1.	β_2.	Skewness.
Population	29·9871	28·6109	891·1887	·0886	2·0233	1·2770
Births	39·1825	142·4337	4091·8552	·3372	2·6652	·7144
Deaths.................	21·2325	391·5979	22459·2957	16·0205	49·8188	·7342
Birth rates	14·7695	31·7140	1286·4067	·3122	5·8972	·1355
Death rates........	18·2788	613·0506	43814·7836	61·5392	131·1374	1·8963

TABLE 13.—*Planarity tests for* 1,000 *sub-districts.*

Rates—	H ("solid η").	$R_{1\cdot23}$.
Death rates upon birth rates and population	·8088	·1521 ± ·0208
Population upon birth rates and death rates............	·4929	·2035 ± ·0204
Absolute numbers—		
Deaths upon births and population	·9384	·7825 ± ·0083
Population upon births and deaths............................	·9759	·9453 ± ·0023

TABLE 14.—*Planarity tests for* 999 *sub-districts.*

Rates—	H ("solid η").	$R_{1\cdot23}$.
Death rates upon birth rates and population	·6796	·1666 ± ·0207
Absolute numbers—		
Deaths upon births and population............................	·9213	·8644 ± ·0054

TABLE 15.—*Correlation constants within the arrays of population (births and deaths in* 1,000 *English registration sub-districts).*

Limits of population within the array.	Number of observations.	Rates.					Absolute numbers.				
		Number of arrays (κ).	r.	η.*	$\sqrt{\frac{\kappa-1}{N}}$.	Linearity test. $\frac{1}{2}\sqrt{\eta^2-r^2}\times\frac{\sqrt{N}}{\cdot 67449}$.	Number of arrays.	r.	η.*	$\sqrt{\frac{\kappa-1}{N}}$.	Linearity test. $\frac{1}{2}\sqrt{\eta^2-r^2}\times\frac{\sqrt{N}}{\cdot 67449}$.
1,000– 1,500	25	16	−·0434 ± ·1346	·9008	·7746	3·3349	4	−·1729 ± ·1309	·3171	·3464	·9853
1,500– 2,000	41·5	18	·1930 ± ·1008	·5056	·6400	2·2319	5	·1281 ± ·1030	·2824	·3105	1·2017
2,000– 2,500	67·5	18	−·1018 ± ·0812	·6251	·5018	3·7530	5	−·1041 ± ·0812	·2272	·2434	1·2299
2,500– 3,000	76·5	19	·0904 ± ·0765	·3036	·4851	1·8790	7	·1986 ± ·0741	·2718	·2801	1·2039
3,000– 3,500	95·5	17	·0445 ± ·0689	·3843	·4093	2·7649	7	·1451 ± ·0676	·3024	·2507	1·9223
3,500– 4,000	89	16	·0369 ± ·0714	·3701	·4105	2·5756	7	·0750 ± ·0711	·2000	·2596	1·2968
4,000– 4,500	69	12	−·1002 ± ·0804	·3450	·3993	2·0328	7	−·0883 ± ·0805	·3140	·2949	1·8481
4,500– 5,000	55	15	−·0461 ± ·0908	·7439	·5045	4·0819	8	−·0247 ± ·0909	·3555	·3568	1·9164
5,000– 5,500	68	14	−·0859 ± ·0812	·5575	·4372	3·3671	9	−·0451 ± ·0816	·5472	·3208	3·3335
5,500– 6,000	64	18	·0100 ± ·0843	·3119	·5154	2·0269	10	·0440 ± ·0841	·2973	·3750	1·7434
6,000– 6,500	58·5	19	−·2020 ± ·0846	·7158	·5547	3·7897	14	−·1961 ± ·0848	·6122	·4714	3·2881
6,500– 7,000	47·5	17	·3320 ± ·0870	·5299	·5804	2·1100	14	·3378 ± ·0867	·6629	·5231	2·9138
7,000– 7,500	49	14	·1265 ± ·0948	·5226	·5151	2·6310	12	·1031 ± ·0953	·2890	·4738	1·4012
7,500– 8,000†	52	15	−·3495 ± ·0821	·9778	·5189	4·8815	13	−·3533 ± ·0819	·9790	·4804	4·8805
8,000– 8,500‡	45	17	·3713 ± ·0867	·9057	·5963	4·1081	14	·3427 ± ·0887	·6820	·5375	2·9321
8,500– 9,000	41	17	−·0334 ± ·1052	·8733	·6247	4·1423	15	−·0379 ± ·1052	·8414	·5843	3·9899
9,000– 9,500	31	10	·2698 ± ·1123	·5841	·5388	2·1383	12	·3314 ± ·1078	·6709	·5957	3·0764
9,500-10,000	25	12	·4254 ± ·1105	·8637	·6633	2·7860	12	·4758 ± ·1044	·8708	·6633	2·6703

* The correlation ratios were calculated only for death rates upon birth rates and deaths upon births respectively.

† Includes one registration sub-district with 745 deaths (D.R. 94·3 per 1,000; B.R. 14·6 per 1000).

‡ " " " " 385 deaths (D.R. 47·6 per 1,000; B.R. 34·4 per 1,000).

TABLE 16.—*Empirical coefficients of partial association based on the geometric means of the correlation basis.*

A. 1,000 *sub-districts.*

Rates—

	Coeff.
Birth rates and population : death rates const.	·1443
Death rates and population : birth rates const.	·1582
Birth rates and death rates : popn. const.	·3128

Absolute numbers—

Births and population : deaths const.	·8176
Deaths and population : births const.	·4510
Births and deaths : population const.	·0789

B. 999 *sub-districts.*

Rates—

Birth rates and population : death rates const.	·1642
Death rates and population : birth rates const.	·1807
Birth rates and death rates : population const.	·2070

Absolute numbers—

Births and population : deaths const.	·7561
Deaths and population : births const.	·1453
Births and deaths : population const.	·1563

TABLE 17.—*A comparison between the correlation constants obtained when using absolute numbers and indices in the case of* 118 *English towns.*

Variables.	Absolute numbers.			Indices.		
	r.	η.*	$\frac{1}{2}\sqrt{\eta^2-r^2}\times\frac{\sqrt{N}}{\cdot67449}$.	r.	η.*	$\frac{1}{2}\sqrt{\eta^2-r^2}\times\frac{\sqrt{N}}{\cdot67449}$.
(1) *Crude values.*						
Cancer and diabetes	+ ·8925	·9174	1·710	+ ·3564	·4989	2·731
	± ·0126	·9094	1·405	± ·0542	·3892	1·259
Cancer and population	+ ·9423	·9511	1·014	+ ·0430	·2364	1·872
	+ ·0070	·9526	1·273	± ·0620	·3681	2·944
Diabetes and Population	+ ·8820	·9003	1·454	+ ·0031	·2166	1·744
	± ·0138	·9080	1·736	± ·0621	·1435	1·156
Cancer and diabetes, population constant.	+ ·3892	....	....	+ ·3566	....	....
	± ·0527	....	....	± ·0542	....	....
(2) *Corrected values.*						
Cancer and diabetes	+ ·8799	·9018	1·697	+ ·0475	·3569	2·849
	± ·0140	·9163	2·059	± ·0619	·2644	2·095
Cancer and population	+ ·9728	·9795	·924	+ ·1218	·2694	1·935
	± ·0033	·9782	·829	± ·0529	·4466	3·460
Diabetes and population	+ ·8909	·9106	1·520	+ ·0462	·2106	1·655
	± ·0128	·9276	2·090	± ·0620	·4264	3·413
Cancer and diabetes, population constant.	+ ·1259	....	....	+ ·0438	....	....
	± ·0611	....	....	± ·0620	....	....

* The two values correspond to the two regressions; that of x upon y and of y upon x.

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1.—*Statistics.* By the late Sir Robert Giffen, K.C.B., F.R.S. Edited, with an Introduction, by Henry Higgs, C.B., with the assistance of G. Udny Yule, M.A. xiii + 485 pp., 8vo. London: Macmillan, 1913. Price 12*s.* net.

Applying to the late Sir Robert Giffen a phrase used by himself about Adam Smith, Mr. Higgs states in his Introduction his belief that in matters statistical "we are none of us wiser than Sir Robert "Giffen." His contemporaries in the field of his favourite pursuit will cordially endorse this tribute to the shrewd commonsense, the penetration, and the comprehensiveness with which he dealt with the figures before him, and the bold and often singularly accurate hypotheses he would frame in order to project those figures beyond their ordinary and apparent scope. Above all, he was, as the Editor truly says, a past master in the discovery and avoidance of pitfalls, and of this trait plenty of evidence is provided in this work. Any one, in fact, rushing in where Sir Robert had put up a Caution Board would be likely to have to admit himself to be what his monitor would most probably have called him. Though versed above most in analysis and statistical method generally, Sir Robert Giffen had taken certain subjects specially to his province, the best known of them being Foreign Trade, Finance and the Money market. All of these are as prominent in the present work as in his previous writings. He has also reviewed, in serial economic order, most of the other branches of the official statistics of this country, showing for each what is the object it is intended to serve, where it may fall short of it, and what is the fullest harvest of statistical information it can be got to yield. By this means he illustrates the application of the principles he sets out to inculcate. Being the work of Sir Robert Giffen, it is unnecessary to point out that these chapters bear the impress of his wide experience and the grave consideration he gave to all matters of public importance upon which he wrote. Equally superfluous would it be to state that there is no avoidance of the controversies of the day, provided they serve as a good text for relevant criticism. A good portion of some of the chapters, indeed, is taken up by the quotation or reproduction of views already published in former works, though none the less pertinent to the argument, or to the author's general object, viz., to make use of such controversies as live instances of statistical treatment on its practical side.

It is not proposed to enter here into the details of the wide field covered in this book. In the first place, the scheme the author had in view has not been completed. Then, again, the figures dealt with relate, as mentioned above, almost entirely to this country, where the improvement and expansion of official statistics have made noteworthy strides since this work was written. Criticism on these points is disarmed by the position with regard to them taken up by Mr. Higgs in his Preface, in which it is said that the work was undertaken twelve years before the death of the author, but carried on by him very spasmodically, and not revised in his later years. The result is that the figures upon which the illustrations and arguments depend are now obsolete, whilst had those of later date been substituted they would not, in some cases, have supported the conclusions drawn from their predecessors. The population, for example, usually quoted, is that of 1891. Changes and innovations, too, have rendered much of the criticism so freely dealt round by the author beside the mark, as many of the shortcomings then justly brought to notice have since been remedied. The Board of Trade census of Production puts out of court the remarks upon this subject made in 1898. The Foreign Trade statistics now include some of the more important detail the lack of which Sir Robert Giffen herein deplores. The London Water Board is not recognised, nor the Canal Commission; the Financial Relations of Ireland rest upon the Report of 1894; and the new form of Financial statement and new method of collecting and expounding Agricultural information are similarly omitted. The taxation reviewed, with the proportion called direct and indirect respectively, is that of the year 1897–98; yet one of the last bits of writing done by the author was a slashing attack upon the "People's "Budget" of 1909. The expenditure of nearly 40 millions on Defence is considered worthy of special justification. The expenditure by the United States of 29 millions upon Pensions is said to be "quite without example in the finance of older countries," and Pensions and Insurance are not mentioned in connection with Pauperism.

It is always a difficult, and generally a very delicate, task to select from the unpublished material left by an author that which it is due to his reputation to give to the world after his death. In the case of Sir Robert Giffen the reputation acquired during his lifetime rests upon a foundation as wide and firm as any of his colleagues and followers could wish, and needs not the addition of work practically abandoned by him, and not markedly original. The belief of Mr. Higgs quoted at the opening of this review, in justification of the publication of these studies, will appear to some to be rather wanting as a working creed; and his conviction as to the wisdom of the author might, if it rested upon this work, have been more widely accepted had a considerable part of the Preface been left out. J.A.B.

2.—I. *The English Convict: A Statistical Study.* By Charles Goring, M.D., B.Sc.Lond. Published by His Majesty's Stationery Office. 440 pp., fol. 1913. Price 9*s*.

II. *Schedule of Measurements and General Anthropological Data.* 1913. Price 5*s*.

The work before us has a double claim to be described as a novelty. In most Government publications the official atmosphere is steadfastly maintained, and there is a certain dryness (by no means to be confounded with dullness), and an avoidance of topics which, however relevant to the issues, might introduce a personal note. In Dr. Goring's work these limitations are not observed; its blue covers and unwieldy format alone distinguish it from the book which any private investigator of equal skill and learning might be expected to publish.

The English Convict's second title to be called a novelty consists in the method of research actually employed. The development of statistics associated with the names of Professor Karl Pearson and his pupils has called forth many memoirs and a few treatises, but Dr. Goring's work is the most extensive application of biometric methods to a particular class of problems which has yet appeared. The most hostile critic of the new school could not peruse the tables and rows of constants which greet the eye on almost every one of Dr. Goring's 440 pages and refrain from a tribute of respect for the patient labour which the results must have involved. The work is divided into two parts. In the former, following on a trenchant introduction in which various schools of criminology are assailed in vivacious language, the alleged existence of a criminal type is subjected to rigorous scrutiny. The conclusion is reached that no physical stigmata of the criminal, in the sense in which the term stigma has been generally employed by the followers of Lombroso, can be shown to exist. In other words, that the criminal is not a *qualitatively* distinct physical type. The second part is divided into several chapters. The first deals with the physique of criminals (it must be understood that the word criminal is used in the strict legal sense of persons actually convicted of crime sufficiently serious to involve confinement in a convict prison), and the conclusion is that criminals, except those technically convicted of fraud, are markedly differentiated from the general population in stature and body weight; there is, in fact, a sense in which the term criminal type is justified, since thieves and burglars (who constitute some 90 per cent. of all criminals) are *quantitatively* differentiated from the non-criminal population in virtue of their inferior average physique. These are, in Dr. Goring's opinion, "the only elements of truth out of which have been "constructed the elaborate, extravagant, and ludicrously uncritical "criminological doctrines of the great protagonist of the 'criminal "'type' theory."

In the second and third chapters age as an etiological factor in crime and the criminal's vital statistics are considered; an interesting calculation of the probable proportion of the population who will eventually be convicted of crime is given. From this calculation it would appear that no less than 20·887 per cent. of the population are sooner or later convicted of some offence. This is reduced to 7·203 by excluding drunkenness and offences such as breaches of municipal laws, and to 1·294 by omission of cases dealt with summarily.

The fourth chapter deals with the mental differentiation of the criminal, and the conclusion is drawn that "the one vital mental "constitutional factor in the etiology of crime is defective intelli-"gence." In the next chapter the relations between criminal conviction and such circumstances as education, employment, alcoholism and the parental standard of living are studied, and the author thinks that his results support the view that "crime in this "country is only to a trifling extent (if to any) the product of "social inequality, of adverse environment, or of other manifes-"tations of what may be comprehensively termed 'the force of "'circumstances.'"

Chapter VI investigates the fertility of criminals and of criminal stocks. Among other conclusions, it appears that habitual criminals are less than half as fertile as star-class convicts, the fertility of the latter being equal to that of the general population. The seventh, and last, chapter sets out the results of an inquiry into the supposed inheritance of a predisposition to commit crime; the method adopted is that used by Professor Pearson and Dr. David Heron in their memoirs on the inheritance of predispositions to pulmonary tuberculosis and insanity, and the conclusion reached is that the force of inheritance is measured by a cœfficient of correlation approximating to ·5 (Professor Pearson's normal coefficient). The last fifty pages of the work contain tables discussed in the text, while the whole of the data are printed in a companion volume.

From this summary it will be seen how large a number of important problems is attacked, and it will be inferred that the statistical treatment is by no means simple, so that the impression formed on the mind of a reviewer in the necessarily limited time available for reading and re-reading must be subject to revision in the light of further study. It may, however, be of interest briefly to indicate some of the difficulties which troubled the present writer in going through Dr. Goring's book.

In the first place, let us consider some questions of pure method. At the beginning of the book reference is made to the fact that the product moment coefficient is not applicable to non-measurable characters and the correlation ratio is introduced, but it seems to us that the validity of the formulæ introduced on p. 48 still ultimately depends on the assumption of linear regression, and to state that in non-measurable cases the coefficient may be approximated to by the use of the ratio opens the door to possibly serious misconceptions. It seems, too, that partial coefficients of correlation based upon total coefficients deduced by different artifices may sometimes be dangerous weapons. Thus on pp. 319–322, partial coefficients are based upon four variables, age—marital condition. weak-mindedness, degree of intemperance. Some of the total coefficients are deduced by Professor Pearson's fourfold-table method, others by his new process for use when one variable is given quantitatively the other in two classes. The assumptions upon which the comparability of these coefficients with the ordinary product moment value depends are not identical in the two cases It would have been interesting to apply both methods to those data which could be so treated. We have applied this test in the case of the data on p. 311, and the fourfold-table method, taking the age division near the mean, gave a value close to that obtained by Dr. Goring; but this might not happen in other cases, and comparatively small differences in the total coefficients may seriously affect the partials. In this connection the extensive use made by Dr. Goring of the fourfold method deserves attention. While we might readily conceive a continuous variable replacing the categories criminal and non-criminal (its normality is another matter) we find it difficult to conceive the continuous variable which the categories "married" and "unmarried" are assumed to summarise. We also think that the interpretation of the correlations between measures of crime and environment is a matter of great difficulty. Dr. Goring explicitly points out (p. 267) that, owing to his enforced restriction to a highly-selected class, these coefficients may be much lower than would have been obtained from a general population; we do not think he is entitled to say that "we may dogmatically "assert that recidivism, in its most pronounced form. is certainly "not a product of any of the social and economic inequalities we have "been examining." It appears to us that Dr. Goring is inclined to press his argument, that environment has little share in the genesis of crime, further than the facts warrant. For instance, he attaches importance to the observation that 3 per cent. of all convictions for acquisitive crime are fraudulent offences, while 4 per cent. of the population belong to the professional classes. The suggestion is that fraud being the form that theft takes among the upper classes, the latter contribute their just numerical quota of thieves. Even taking the figures as they stand, there is a difference of 33 per cent. to explain.

Dr. Goring is not always happy in the use of the theory of the errors. A conspicuous instance occurs on pp. 313–314. At the foot of p. 313 Dr. Goring correctly states, even citing Professor Pearson's well-known paper in the *Philosophical Magazine*, that the usual formula for the standard deviation of the proportion in a small sample m. after a first sample of n assumes that the proportion p has been observed, in an *indefinitely large sample n*. But he actually illustrates this, taking as p the proportion observed in a very small sample, 15. In a similar way, many of the probable errors inserted in the table on p. 203 appear to be of little value as measures of errors of sampling.

Lastly, the argument based upon the fertility of criminal stocks is, we think, erroneous; but reasons for this criticism having been fully described in a paper by Mr. Udny Yule and the present writer in the last issue of this *Journal*, it is unnecessary to deal with the matter here, beyond remarking that, as Dr. Goring attaches considerable importance to his results under this head, it is to be hoped that the validity of the method will be investigated by other workers and the point finally settled.

Dr. Goring computes the morbidity rates of the convicts and compares them with Mr. Watson's Manchester results. He observes that "upon the evidence of these statistical results, we can only "conclude that there is no etiological relation between sickness and "crime; or that, if any difference there be, it is law breakers who, "on the whole, enjoy slightly better health than law-abiding people." But, a few pages further on, he writes: "We must admit then, "that the death-rates from all the causes we have just been con-"sidering (accidental negligence, suicide, contagious fevers, enteric "fever, intestinal obstruction and peritonitis) are directly modified "by the special environmental conditions of English prisons; they "do not represent the relative death-rates of criminals as a class, "and of the law-abiding public, but they exemplify the rates at which "*any* class of persons, living in the respective circumstances of im-"prisonment or freedom, might be expected to die from the causes "specified." Dr. Goring goes on to consider whether the death-rates from other diseases might not also be modified, and concludes that since the difference between the rate of all the above-mentioned diseases together and the corresponding figure for the general population is not large, a comparison in the case of other diseases not obviously influenced by the environment is valid. But the morbidity data of persons living in convict prisons do not seem to us to justify any conclusions as to the health of the same class of persons when at large. The comparison, in fact, seems to beg an important question.

The analogy between the age-distribution of first offenders and that of certain diseases is also rather a slender basis for deductions as to the importance of constitutional proclivity to crime, and it is difficult to reconcile it with the somewhat magisterial dictum (on p. 214) that "inferences from facts have no scientific "value."

In referring mainly to points respecting which differences of opinion are possible, it must not be supposed that the significance of Dr. Goring's achievement is undervalued. *The English Convict* is beyond doubt one of the most important contributions to criminological literature which has yet been made. Dr. Goring and his colleagues are to be congratulated on the completion of their task, and they will have the satisfaction of feeling that the book will be read and prized by all who realise the importance of modern statistical methods. M.G.

3.—*Die Deutsche Landwirtschaft.* Bearbeitet im Kaiserlichen Statistischen Amte. 279 pp., 8vo. Berlin: Puttkammer und Muhlbrecht, 1913. Price 1,50 marks.

This work aims at presenting a complete statistical survey of German agriculture, in a form convenient for those who do not desire to explore the twenty-two volumes dealing with the *Berufs und Betriebzahlung* of June, 1907, besides similar inquiries at previous dates and other statistical data dealing with the subject. So far as available, data up to 1912 have been included and comparisons with the returns of previous years. The survey comprises fifty chapters dealing with agricultural population, holdings, tenure of land, labour, area and production of crops, and crop reports; prices, imports and consumption of corn and potatoes; live-stock, abbatage, prices and trade in stock, and animal diseases; subsidiary agricultural industries and forestry, among other matters. Excellent diagrams, cartograms and maps in colours are liberally distributed throughout the volume, and a list of sources is appended.

The survey forms a very useful mine of official information, but no attempt is made to supply by estimates the missing data, which include statistics of dairy and meat production and consumption, of agricultural wages, estimates of the value of the crops, &c., produced and of the net agricultural output as understood in the British census of production.

The total population of Germany at the census of 1907 was 61,721,000, of which 17,681,000 belonged to the agricultural population, as compared with 19,225,000 in 1882. The proportion fell from 42·5 per cent. to 28·6 per cent. In 1907 54·7 per cent. of the population were country-born, but 16·7 per cent., being country-born, were enumerated in cities, while 3·2 per cent. were born in cities and enumerated in the country. The number of agricultural holdings in 1907 was 5,736,000, or 260,000 more than in 1882; the increase was chiefly in holdings under about 1¼ acres in area, and those of 7½ acres and under 50 acres. Holdings of 50 acres and above have diminished since 1895. The labour employed was approximately 13 persons per 100 acres, though on holdings of less than 1¼ acres it averaged as much as 95 persons per 100 acres, and 36 per cent. of the holdings belonged to this class.

The yields per acre of crops in Germany show marked increases in the twentieth century, but the change in 1899 in the method of crop estimating explains part of this rise, though it is claimed that manuring, better seeds and succession of crops and improved tools and machinery have had their part.

Germany remains self-supporting as regards rye, oats and potatoes, but imports of wheat have increased from 27 per cent.

of the total supply in 1893–96 to 35 per cent. in 1906–11, though in 1907–08 the proportion reached nearly 40 per cent. Imports of barley have increased from 30 per cent. in the earlier period given to 46 per cent. in the later period. The consumption of rye, for all purposes, has fallen between the same periods, from 334 lbs. per head to 317 lbs., while that of wheat has increased from 174 lbs. per head to 184 lbs. The live-stock returns also present special interest. H.D.V.

4.—*The Land and the Commonwealth.* By T. E. Marks, with an Introduction by J. Hugh Edwards, M.P. xxv + 314 pp., 8vo. London: P. S. King and Son, 1913. Price 5*s.*

The present "land campaign" of the Government is likely to give rise to the publication of a number of books, controversial or impartial, of ephemeral or more lasting value, dealing with agrarian reform. That before us belongs to the former class. We are prepared by the unreserved admiration of Mr. Lloyd George's "genius for constructive statesmanship" expressed by a Welsh member of Parliament in the introduction to find that the "opulence "of information "and "mastery of detail," which are there ascribed by Mr. Edwards to the author of this book, have been devoted in the main, if not exclusively, to the cause, be it good or bad, of partisan polemics. Mr. Marks certainly puts his points with no lack of vigour or directness: but, although he tells his readers in one passage that he has tried to take impartial views, the weakness of the flesh has evidently in this as in so many instances been too much for the willingness of the spirit. It is possible that some of those who consult these positive pages may feel, with his introducer, that the essayist "locates the vulnerable spots," which doubtless exist, as in all human institutions, "in the ramparts" of the present English "system of land tenure." But the military simile indicates appropriately the tone and temper of the book. They are the reverse of judicial. Mr. Marks admits indeed that there may possibly be some fair landlords in the country, and that the leasehold system in the towns has helped the suitable development of urban property in some respects, and that in our projects of reform we must not destroy the good when we remove the bad. But such concessions are in effect immediately withdrawn when they have grudgingly been made. The general impression left and intended to be left, unless we misread the purpose of the writer, is one of wholesale final condemnation, in which merits are of necessity ignored or minimised, and failings are perforce emphasised and magnified. Mr. Marks states, it is true, that his conclusions are supported by his own personal experience as a manager of landed estate, and that he had anticipated for himself the main conclusions reached by the Land Inquiry Committee. But from first to last he is an impassioned advocate, who feels no more doubt about the folly or knavery of his opponents than of the absolute certainty and rectitude of his own case. His book may not improbably give pleasure to his friends: it cannot satisfy or content the detached bystander. It is in fact full of the *parti pris* which fans controversy rather than advances knowledge. It is at the best an *exposé* and not an investigation of a system; nor consequently are its facts or its opinions very new.

L.L.P.

5.—*L'Évolution du Commerce du Crédit et des Transports depuis cent cinquante ans.* Par B. Nogaro et W. Oualid. 444 pp., 8vo. Paris: Felix Alcan, 1914. Price 5 francs.

In this interesting survey the joint authors review the development of commerce, in contrast with that of industry, during the last century and a half. That the period to which they bring their study down is recent may be demonstrated by the reference to aerial navigation contained in their account of the means of transport, and by the inclusion of the "gold-exchange standard," of which India has been furnishing a successful but not solitary illustration, in their description of the development of that monetary mechanism which is an indispensable tool of trading transactions. The division, never perhaps very easy to accomplish, and often ineffectively achieved, of the labour of preparation and composition between the dual writers of a single book has been made satisfactorily in this instance by the assignment to one of the subject of the evolution of commerce and transport in its general character as a whole, and to the other of the discussion of the more special characteristics of the systems of money and credit. But this distribution of topics is to some extent crossed in the treatment of fiscal policy. For there, while Professor Nogaro is responsible for the examination during the period extending from the middle of the nineteenth century onwards, M. Oualid, of necessity perhaps, comprises in his general review of trade and transport in the earlier time a statement and a criticism of the tenets and the practices of the Mercantile System.

The book follows a chronological order with five separate sections. In the first the condition of affairs at the close of the *ancien régime*, in the second the position during the revolutionary period and the beginning of the nineteenth century, in the third the state in the middle of that century, in the fourth the organisation of commerce at the end of the century, and in the fifth and last the present aspect of trade and trading matters, are successively described. Although France receives, as is natural, the preponderance of attention, other countries are included in the purview; and the English student will note with appreciation and advantage the informed and opportune references to the incidents and movements of our business history. The plan of the whole work is clear and suitable, the proportions assigned to the several subjects treated seem to us judicious and appropriate, and the narration is at once accurate and attractive. The authors appear to have conceived and executed their useful task with ability and pains. They show, for instance, how the development of commerce, which was at the first the more conspicuous, had to yield the primacy to the astonishing growth of an industry transformed by changes deservedly described as "revolutionary," and then, once again, stimulated by the forcible impulse given, the older variety of economic activity attained larger dimensions and underwent fresh change, until at the present moment its international character and its vast influence on the lives of men must be recognised by all observers. L.L.P.

6.—*Éléments d'Économie Politique—Répartition—Consommation—Doctrines.* Par Bertrand Nogaro. 291 pp., crown 8vo. Paris: M. Giard et E. Brière, 1914. Price 4 francs.

In this concluding half of an elementary treatise, dealing as a whole in suitable outline with the principles of Economics, the capable and instructed author shows that, without sacrificing in any way his own independence, he can appreciate and utilise the work—past and present—done by other writers in the exposition of their "systems." His own general scheme of discussion is simple and appropriate: his assignment of space to different parts of his subject is judiciously proportioned: his manner of statement is at once clear and attractive; and the student, who has read this manual from the first page to the last may, we think, be confident that, while he has been supplied agreeably with the means of gaining a sufficient and correct knowledge of the present state of authoritative scientific opinion on the distribution and the consumption of wealth, the final section treating of the previous development of economic thought furnishes as interesting and impartial and informed a conspectus of the chief schools and the leading tendencies as he is likely to find in any other quarter.

Combined too with the adequate and exact re-statement of accepted views, he will discover here a welcome freshness of apt innovation on some important points of classification or terminology. For Professor Nogaro adroitly uses the recent extension of the idea of "rent" from land to other spheres of economic activity, and the exhibition of "enterprise" by the possessors and controllers of agricultural land at least, which in the existing *milieu* of farming practices must be deemed a necessary condition of the continued enjoyment of an income from such property, as a reason for departing from older categories that had been made of the sharers in the distribution of wealth. "Profit" and "rent" are by him treated in close relation to one another as falling both to the business-employer and to the landed-proprietor who are similarly embraced within one class. The other classes consist respectively of "capitalist"-lenders securing interest and "salaried" labourers receiving wages. He is in more accord with contemporaneous authors in viewing distribution as a branch of exchange, and in allowing neither "cost "of production" nor "final utility" to monopolise the *rôle* of the determining influence in settling the value that appertains both to goods and to services in an economic market. The part played by the State in the sphere of distribution is emphasised by him and a more extended treatment given to the topic. In the section on

Consumption, facts such as the action and arrangements of co-operative societies, the use or abuse of credit, and the principles and methods of insurance, are more prominent than theoretic reasoning. L.L.P.

7.—*Il Progresso Economico.* (*L'Italia di oggi.* Serie 1, N. 1–3.) By Dr. Napoleone Colajanni. 272 and 135 pp., 2 vols., sm. 8vo. Rome: C. A. Bontempelli, 1913. Price 4 frs. 50 c.

This work is the first of a series which has been planned with the object of describing the various aspects of Italian life at the present day. Dr. Colajanni's theme is the economic progress of united Italy; he writes as an optimist and contrasts his present cheerful note with the general wail of pessimism which went up from Italian economists and publicists towards the end of the nineteenth century.

Dealing first with agriculture, which is of primary importance to Italy and gave occupation, according to the census of 1901, to nearly 38 per cent. of the population over nine years of age, Dr. Colajanni shows that there has been an increase since 1870 in the area of land under cultivation, together with a still greater increase in the productivity of the soil. At the same time there has been a very considerable development in the manufacture of certain agricultural products, such as butter and cheese. The rising prosperity of the land is witnessed by the heavy increase in the exports of agricultural produce, while the growing importation and domestic production of chemical manures and other scientific aids to agriculture testify to the improvement in methods.

A development even more remarkable, in view of Italy's lack of coal and iron, is seen in the manufacturing industries, particularly in the engineering, chemical and textile trades. A twofold fact of great importance in this connection is the vast increase in the imports of raw materials and the exports of manufactured articles, a sure proof of the industrial development of a country.

The growth in both the foreign and domestic trade of Italy has been very great. During the past forty years the foreign trade has almost trebled, the average annual imports having increased from 1,181 millions of francs for the period 1871–75 to 3,050 millions for the years 1907–11 and to 3,604 millions in 1912, while the average annual exports rose from 1,073 millions of francs for the years 1871–75 to 1,926 millions for the period 1907–11 and to 2,396 millions in 1912. The great and growing excess of imports over exports is largely accounted for by the remittances received from emigrants and by the money spent in Italy by foreign visitors, the annual income from these two sources having been estimated at about 1,000 millions of francs.

There has been a noteworthy growth during the last half century alike in the consumption and the savings of the Italians, the savings invested in banks and other institutions amounting to upwards of 7,000 millions of francs on June 30, 1912. A large part of this sum was invested in the people's banks, land banks and post office savings banks, which indicates, as Dr. Colajanni might have pointed out, that the working classes have a large share in the country's savings.

Between 1862 and 1903 there was a considerable increase in wages together with a sensible reduction in prices, the joint effect of which was an increase in *real* wages which has been estimated at 100 per cent. in the textile trades and even more in the chemical and building industries. In the case of agriculture there appears to have been an increase of 100 per cent. in money wages between the inquiry of Jacini (1881–85) and that of Faina (1910). There has been a fairly rapid rise in prices since 1905 in Italy as in other countries, but in Dr. Colajanni's opinion the increase in wages has about kept pace with it.

The growing prosperity of the country is reflected in the great increase in the banking business transacted and in the improved financial position of the principal banks. At the same time there has been a striking improvement in the national finances, while it is estimated that the accumulated private wealth of the people has reached the sum of 80,000 millions of francs.

Dr. Colajanni draws many interesting comparisons between the rate of progress in Italy and other countries, which show that, while Italy still falls very far short in many respects of the standard reached by England and the other leading industrial nations, she has made a wonderful advance on her own position in the past, and in many directions has progressed more rapidly than her competitors. Thus, although the volume of England's foreign trade has increased enormously since 1871, Italy's foreign trade, which was only 13 per cent. of England's in the period 1871–75, had reached 17 per cent. in the period 1909–11.

The principal cause to which Dr. Colajanni attributes Italy's progress is the unification of the country, which not only promoted national self-respect and thus stimulated the energy of the people, but also added greatly to the efficiency—born of unity of purpose—of the State and rendered possible important economies in administration. The State has done much to help private enterprise; for example, by carrying through schemes of irrigation and land reclamation, building roads, promoting technical and commercial education, and of recent years—though Dr. Colajanni does not mention this—by far-reaching social legislation. There are many directions in which it is claimed—often with justice, as Dr. Colajanni admits—that the State should have done more, but that it has done much good work cannot be denied.

Dr. Colajanni is a convinced protectionist, and lays stress on the undoubted fact that Italy has made most rapid strides under the protectionist *régime* initiated in 1887, though he is too fair and clear-sighted to claim that her progress is entirely due to the tariff. This tariff, which Dr. Colajanni regards as one of the greatest benefits conferred by the State on united Italy, is viewed with great hostility, however, by free traders, who deny that it has been of any real service to the country.

There are some unfortunate gaps in this interesting record of economic progress. The great achievements of Italy in the field of co-operation are passed over with a bare mention, and the development of trade unionism is only touched on incidentally in the course of a refutation of the exaggerated claims of those Socialists who ascribe the improvement in the condition of the working classes solely to the activities of the unions. The housing problem, pressing both in the country and in the towns, is ignored—and so, therefore, are the efforts made to deal with it.

In spite of these omissions, however, Dr. Colajanni's work, which contains a wealth of carefully compiled statistical information, may be warmly recommended to all who are interested in the progress of modern Italy. It may be added that the next volume promised in this series is a work on social legislation. S.L.B.

8.—*The Nature and First Principle of Taxation.* By Robert Jones, B.Sc. (Econ.), with a preface by Sidney Webb, LL.B. xvii + 299 pp., 8vo. London: P. S. King and Son. 1914. Price 7*s.* 6*d.* net.

This book is a resolute attempt to get a distilled essence of opinions about taxation. Numerous writers have endeavoured to furnish us with the true canons and first principles, and the results, though many and various, run very much upon recognisable main lines. What is their highest common factor?

In the first chapter Mr. Jones discusses "the nature of a tax," and classifies the various sources of public revenue in a manner which is neither obvious nor novel. Here the dichotomists will enjoy themselves, but in moderation, as the author is not an advanced hair-splitter of the Teutonic type. The collection of definitions and of quotations may prove of service to many students. His conclusion that compulsion is the essential mark of tax-payments is a logical one.

The second chapter occupies one-third of the book, and consists mainly of quotations from writers on public finance, with a minimum of comment—a veritable anthology. The extracts are arranged in nine chronological sections, to illustrate the development of ideas about taxation. The author disarms criticism of his method by admitting that it is easier and pleasanter for the reader if all the matter is presented in a developed statement, where arrangement and "digestion" is done by the writer, and the reader has but to follow his orderly progress. But one cannot be so sure that such a method is "easier and pleasanter for the *writer*" than the mere aggregation of extracts. The former method may have the disadvantage that the reader is "asked to accept a great deal on the "authority of the writer," but in the extract method the reader's thought dashes backwards and forwards, there is such a great deal of context suppressed, and a knowledge of many economic principles is assumed, so that only those who are already familiar with economic works can hope to trace out surely the development for themselves, and even they are put to much hard work. Mr. Jones invites us to do his research with him, but he gets down the books for us, and marks the places; in the capacity of librarian he is hard working and splendidly complete. I am not fully convinced, however, that his method has really justified itself.

The third chapter, on the "First Principles of Taxation," contains some excellent writing. A classification of the emergent principles of the preceding collection is made, and the author strikes boldly for a grand first principle of Economy, and by giving it a new economic connotation, he makes it swallow its most serious rivals. Economy comes out as the principle which takes the least useful portions of incomes, in a national sense primarily and in the usual subjective sense only secondarily. This chapter is without doubt a real contribution to the subject of taxation. But Mr. Jones has not perhaps made the most of his opportunity, for his "least useful "portion" is always in a quantitative sense, in relation to the total *amount* of the incomes and their marginal significances, and never to the qualitative aspects, which deal with the special faculty for tax bearing possessed by some portions of income. This aspect to-day is increasingly important. The last ten pounds of a 500*l*. income may have the same marginal significance as the last thirty pounds of a 1,000*l*. income, but the 500*l*. may contain 100*l*. of special faculty unearned increment (the true surplus with no functional significance in the Hobsonian sense), and the 1,000*l*. income may be all "for services rendered." A differentiated Income Tax may have its rationale mainly in the differences on the spending side, but the differences on the earning side are not without importance—while our own Land Increment Tax and the recent German general capital increment taxes are aimed purely at the special faculty resting on certain classes of income, apart altogether from amounts of income.

The last chapter on the limitations of the Principle of Economy rounds the argument off well, and it would be difficult to say, apart from isolated statements which are open to question, that Mr. Jones has not well made out his case for the fundamental importance of Economy, as defined by him. On page 225 the printer has contributed a novel canon: Electricity. The intentional humour, however, is acceptable, too, and there are neat phrases not a few.

J.C.S.

9.—*Other New Publications.**

Bacon's "Citizen Series" Maps of London. Fol. London: G. W. Bacon and Co., 1914. Price 7*s*. 6*d*. net.

[These maps contain a good deal of interesting information hitherto not easily accessible to the public.]

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* See also "Additions to the Library," page 374, *sqq*.

Bennett (*E. N.*). Problems of Village Life. (Home University Library.) 256 pp., sm. 8vo. London: Williams and Norgate, 1914. Price 1*s.* net.

[The author gives a short historical sketch of the English land question and discusses also the questions of migration to towns, education, housing and wages, small holdings, co-operation and credit. He was, however, unable to avail himself of the information given in the Report of the Land Enquiry Committee (vol. 1), since his book was already in the press when the Report was published.]

Bernis (*Francisco*). Estudios estadisticos. Contribucion à la Investigacion de la situacion economica de los trabajadores en España. 39 pp., 8vo. Barcelona: Tipografia La Acadèmia, 1914.

[An examination of the cost of living and wages in Spain.]

Green (*C. E.*). The Cancer Problem, a Statistical Study. 3rd edition. 98 pp., 8vo. London: W. Green and Sons, Ltd., 1914. Price 5*s.* net.

Harben (*Henry D.*). The Rural Problem. viii + 169 pp., 8vo. London: Constable and Co., 1913. Price 2*s.* 6*d.* net.

[This book embodies the report of a committee which was appointed by the Fabian Society in 1912 to inquire into land problems and rural development. The members of the committee included those with a special knowledge of certain aspects of country life, and the volume claims to be a serious contribution to the question. One member of the committee disagreed with the minimum wage policy advocated, especially as regards its effect on the farmer, but the rest of the committee were at one on all the main issues. The inclusion of a chapter on women in agriculture was intended, but this was abandoned owing to the difficulty of obtaining satisfactory data. The aim of the committee has been to give up-to-date facts and figures on many aspects of the question.]

Heron (*David*), D.Sc. Mendelism and the Problem of Mental Defect. 1. A Criticism of Recent American Work. 62 pp., 8vo. London: Dulau and Co., 1913. Price 2*s.* net.

Hopkins (*Chas. P.*). Altering Plimsoll's Mark. 68 pp., 8vo. London: Simpkin, Marshall and Co., 1913. Price 1*s.* net.

[A criticism of the action of the Board of Trade in altering the load line in the mercantile marine.]

Huart (*Albin*). L'Organisation du Crédit en France. 351 pp., 8vo. Paris: Giard and Brière, 1913. Price 7 frs.

[An endeavour to supply a want which, in the author's opinion, is felt in French economic literature—namely, a book bringing together the principal characteristics of French banking and showing its guiding principles at the present time. The work does not profess to be exhaustive, and the author invites criticism of his theories, which he hopes to amplify in a later work. Among the subjects dealt with are:—The importance of new methods of payment, especially the increasing use of cheques and crossed cheques in France, the Bank of France, the development of credit institutions and their influence in the economic and financial *essor* of the country, provincial banks, investments of French capital at home and abroad and the reform of French colonial banks.]

Keiler (*Dr. Hans*). Probleme der Weltwirtschaft. American Shipping: its history and economic conditions. xx + 144 pp., la. 8vo. Jena: Gustav Fischer, 1913. Price 6*s.*

[This book was written under the auspices of the University of Kiel, but as it was considered that the demand for a book of this nature would probably be greatest in English-speaking countries, it is written in that language. The rise and decline of the ocean shipping of the United States and its causes are carefully studied, and also the means that have been adopted on different occasions to remedy that decline.]

Kempkens (*D. H. J.*). Die Ruhrhäfen, ihre Industrie und ihr Handel. viii + 128 pp., 8vo. Bonn: Marcus and Webers, 1914. Price 5 marks 60 pf.

[An economic and statistical study of the industries and commerce of the inland waterways of the Ruhr district and their development in recent years. The industries specially dealt with are iron and steel, wood, coal, petroleum, milling and grain. There are numerous tables and diagrams.]

Pigou (*A. C.*). Unemployment. (Home University Library.) viii + 256 pp., sm. 8vo. London: Williams and Norgate, 1913. Price 1*s.* net.

[This book has been written for a public consisting mostly of persons unfamiliar with economic analysis, and in view of this fact technical terms have been avoided as much as possible. The problem is, however, of so complex a nature that the author recognises that the argument must inevitably present difficulties to those unaccustomed to close reasoning on these matters.]

Redfern (*Percy*). The Story of the C.W.S. The Jubilee History of the Co-operative Wholesale Society, Limited, 1863-1913. viii + 439 pp., 8vo. Manchester: The Co-operative Wholesale Society, Limited, 1914. Price 3*s.* 6*d.* net.

[A complete history of the origin and growth of the Co-operative Wholesale Society, and also of the principles upon which it was founded and on which it is managed. It is remarked in the preface that the society has been charged with departing from the principles of the Rochdale Pioneers, but it is claimed that to the student it is clear that the history of the society is one logical, persistent and almost automatic working out of those principles. The book is divided into twenty-eight chapters and there are numerous appendices, among which may be mentioned a comparison of the cost of food during thirty years, a short statistical history of the society, and three diagrams illustrative of economic history from 1860 to 1912 by Mr. G. H. Wood, F.S.S.]

Taylor (*W. G. Langworthy*). The Credit System. x + 417 pp., 8vo. New York: Macmillan and Co., 1913. Price 10*s.* net.

[This book explains what credit is, what it does, and how it works. The author cautiously warns his readers that it is hardly to be expected that those who welcome its scope will agree with the methods by which it attains its ends, and adds that evolutionary explanation has made but slow progress in political economy, the very domain from which it sprung, except as regards the theory of wages and the theory of value. His purpose is to bring the theory of credit under its influence.]

Van Antwerp (*W. C.*). The Stock Exchange from Within. 459 pp., sm. 8vo. London: Effingham Wilson, 1913. Price 6*s.*

[A description of the New York Stock Exchange written by a stockbroker in the hope that "it may serve in some degree both to dull the sharp edge of uninformed criticism and to strengthen the hands and hearts of loyal friends of a greatly misunderstood institution." The book is divided into ten chapters, and among the subjects discussed are the uses and abuses of speculation, the relationship between banks and the Stock Exchange, panics and the crisis of 1907, and a brief history of legislative attempts to restrain or suppress speculation. The ninth chapter describes the London Stock Exchange and compares its working with that of New York, and the last chapter deals with the Paris Bourse. As an appendix, is given the Report of the Hughes Commission of New York State on Speculation in Securities and Commodities, 1909.]

Vischer (*Dr. Hans Wolfgang*). Geburten- und Sterblichkeitsverhältnisse der Stadt Mannheim unter besonderer Berücksichtigung der Zeit seit der Jahrhundertwende. 132 + 32 pp., 8vo. Heidelberg: Rössler and Herbert, 1913.

[A statistical study of the vital statistics of Mannheim for recent years Births, deaths, causes of death and infant mortality are discussed in detail.]

Wehberg (*Dr. Heinrich*). Die Bodenreform im Lichte des Humanistischen Sozialismus. xiii + 170 pp., 8vo. München: Duncker and Humblot, 1913. Price 5 marks.

[Written by the late Dr. Wehberg to commemorate the 25th anniversary of the foundation of the German Union for Land Reform in that country. The book, which opens with a short memoir of Wehberg, gives a full account of the movement of which he was one of the originators.]

Whelpley (*J. D.*). The Trade of the World. 436 pp., 8vo. London: Chapman and Hall, 1913. Price 9*s.* net.

[The author in this readable volume makes no pretence of dealing with the subject fully or finally, and the scope of the subject is so large that only a few of the more important or typical countries can be dealt with in some detail. But the author will be satisfied if his work will help the reader to "obtain a better appreciation of the common sense, wisdom, knowledge and courage required, not only of the individual, but of nations, in seeking successfully a fair share of international commerce." There are numerous photographs illustrating the subject.]

Wright (*Sir Robert S.*) and *Hobhouse* (*Rt. Hon. Henry*). An outline of Local Government and Local Taxation in England and Wales (excluding London). 4th edition. vii + 211 pp., 8vo. London: Sweet and Maxwell, Ltd., 1914. Price 7*s.* 6*d.* net.

[In the present edition it has been found necessary to re-write the chapters on small holdings and working class dwellings, and to make various additions to other chapters. Part III and the statistics and figures throughout the book have been revised and brought up to date.]

U.S.A. Annals of the American Academy of Political and Social Science. September, 1913. The Negro's Progress in Fifty Years. vi + 266 pp., 8vo. Philadelphia: American Academy of Political and Social Science, 1913.

[A collection of papers by different authors dealing with the position of the negro in the United States during the past fifty years.]

——— January, 1914. Housing and Town Planning. vi + 296 pp., 8vo. Philadelphia: American Academy of Political and Social Science, 1914.

[This volume consists of thirty-six Papers by different authors on Housing and Town Planning, which are grouped under the following heads:—1, Introductory; 2, The new house; 3, The old house; 4, Special Papers; 5, Town planning. In a work of this kind an index is very necessary, and the one supplied is adequate.]

Xme Congrès International des Habitations à Bon Marché. La Haye-Schéveningue—September, 1913. Rapports. Parts 1, 2 and 3. 3 vols., 8vo. Rotterdam: Nijgh and Van Ditmar's Uitgevers-Mij, 1913.

[The Tenth International Congress on Housing of the Working Classes was held at The Hague in September last, and the Papers read by the delegates from the different countries represented at the Congress are printed in these three volumes of Reports. The Papers are either in English, French or German, and in every case the conclusions arrived at by the authors are printed in the three languages. The questions considered by the Congress were grouped under the following heads:—1, Slums to be improved or cleared. 2, Rural housing. 3, Overcrowded dwellings. 4, Town Planning, and 5, Recent Housing Progress. Many of the Papers contain interesting statistical tables as to housing accommodation and the rents paid in different countries. A "Compte-rendu" of the Congress has still to be published.]

CURRENT NOTES.

The trade returns for January may be considered on the whole fairly satisfactory. Though imports show a decrease in value, much of this is due to lower prices; while exports show a good increase. The subjoined figures compare the twelve months ending January, 1914 with the twelve months ending January 1913:—

[000's omitted.]

Imports.	Twelve months ending January, 1914.	Twelve months ending January, 1913.	Increase (+) or Decrease (−).
Imports, value c.i.f.—	£	£	£
I. Food, drink and tobacco	292,000,	278,552,	+ 13,448,
II. Raw materials and articles mainly unmanufactured	277,781,	280,476,	− 2,695,
III. Articles wholly or mainly manufactured..........................	192,726,	186,924,	+ 5,802,
IV. Miscellaneous and unclassified (including parcel post)....	3,301,	2,966,	+ 335,
Total merchandise....................	765,808,	748,918,	+ 16,890,
Imports of bullion and specie	74,521,	68,257,	+ 6,264,

[000's omitted.]

Exports.	Twelve months ending January, 1914.	Twelve months ending January, 1913.	Increase (+) or decrease (−).
Exports of produce and manufactures of the United kingdom, value f.o.b.—	£	£	£
I. Food, drink and tobacco	32,744,	32,656,	+ 88,
II. Raw materials and articles mainly unmanufactured	70,089,	60,330,	+ 9,759,
III. Articles wholly or mainly manufactured..........................	413,536,	389,221,	+ 24,315,
IV. Miscellaneous and unclassified (including parcel post)	11,453,	10,045,	+ 1,408,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	15,977,	15,241,	+ 736,
II. Raw materials and articles mainly unmanufactured	63,348,	68,082,	− 4,734,
III. Articles wholly or mainly manufactured..........................	29,078,	29,353,	− 275,
IV. Miscellaneous and unclassified (including parcel post)	143,	172,	− 29,
Total, British, foreign and colonial	636,368,	605,100,	+ 31,268,
Exports of bullion and specie	57,811,	64,945,	− 7,134,

[000's omitted.]

Shipping.	Twelve months ending January, 1914.	Twelve months ending January, 1913.	Increase (+).
	Tons.	Tons.	Tons.
Total, British and foreign, *entered* with cargoes	49,004,	46,356,	+ 2,648,
Total, British and foreign, *cleared* with cargoes	67,849,	62,507,	+ 5,342,

Mr. Sauerbeck's index-number of prices for January, as given in the *Statist*, is 83·5, as against 83·8* in December, 1913, and 86·9 last March, the average of the eleven years 1867-77 being taken as 100. A feature of the month was the rise in metals and the fall in animal food. The substantial recovery in metals and the moderate recovery in cereals were due in the main to the wonderfully rapid change in the condition of the money market, a condition of ease succeeding a period of severe stringency. The rise in the prices of iron, tin and lead were specially pronounced. Articles of food were 75·0 as against 75·7* in December, and materials 89·7 as against 89·8*. The *Economist* index-number stands at 2,624, as compared with 2,623 in December.

According to the Board of Trade *Labour Gazette*, the state of the labour market last December was as follows :—

	Trade unions making returns. Net membership.	Reported as unemployed.	
		Number.	Percentage.
December, 1913	965,500	25,229	2·6
November, 1913	967,361	19,668	2·0
December, 1912	894,297	20,938	2·3

Employment was good on the whole in December, but at the end of the month was somewhat affected by holiday suspensions in the engineering and other industries. There was again a reduction in the number of pig-iron furnaces in blast, but employment improved slightly at iron and steel works, and continued good in engineering and shipbuilding. The woollen and worsted trades declined in all departments, and there was some slackness in cotton weaving. There was also a further seasonal decline in the building trades. Employment at coal mines remained very good. It is reported by the Labour Exchanges that there was a continuance of the demand for labour in the shipbuilding industry. A deficiency in the supply of women was reported in the linen trade. Wages in the manufactured iron trades continued to fall in consequence of the decline in prices; in other trades the upward movement continued. Compared with the good conditions of December, 1912, employment on the whole showed some falling off. There was a marked decline in the pig-iron, iron and steel, and tinplate trades. The textile trades also showed a decline, especially in woollen and worsted, and in cotton weaving. On the other hand there was some improvement in the printing and furnishing trades.

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* In the *Statist* for January 10 the figures were given respectively as 83·9, 75·0, and 90·0, but have since been corrected as above.

A conference was held in January at the London County Council Hall, under the chairmanship of Mr. Geoffrey Drage, to consider the question of a Statistical Survey of British Towns, and the issue of a volume of comparative municipal statistics on the same lines as those published by the municipal authorities in Paris, Berlin and Vienna. The following cities, among others, were represented:—Birmingham, Leeds, Liverpool, Manchester, Sheffield, Aberdeen, Dundee and Glasgow. There were also present the Chairman of the London County Council (Mr. Cyril Cobb), Sir Laurence Gomme (Clerk), Mr. James Bird (Deputy Clerk), and Mr. H. E. Haward (Controller). The Chairman outlined the objects of the survey, which were defined as follows:—(i) To ascertain whether any economies could be effected by a yearly comparison of the cost of municipal services; (ii) the increase of efficiency; (iii) self-defence against the Government; and (iv) to show the necessity of the reform of local self-government, which was rapidly becoming chaotic. The Chairman pointed out that the conference had been summoned in accordance with a decision of the London County Council, which had been agreed to by all sections of political and economic thought on that body. The Council were prepared to pay the expenses of printing and publication.

Under the auspices of the Royal Society of Edinburgh, the tercentenary of the publication of John Napier's *Logarithmorum Canonis Mirifici Descriptio* is to be celebrated in Edinburgh by a Congress on Friday, July 24, 1914, and following days. The celebration will be opened on the Friday with an inaugural address by Lord of Appeal Sir J. Fletcher Moulton, followed by a reception given by the Lord Provost, Magistrates and Council of the City of Edinburgh. On the Saturday and Monday the historical and present practice of computation and other devolpments closely connected with Napier's discoveries and inventions will be discussed. A memorial service will be held in St. Giles' Cathedral on the Sunday. Relics of Napier, collected by Lord Napier and Ettrick and other representatives of the family, will be on view; and it is intended to bring together for exhibition books of tables and forms of calculating machines, which may reasonably be regarded as natural developments of the great advance made by Napier. Individuals, societies, universities, public libraries, &c., may become founder members on payment of a minimum subscription of 2*l.*; and each founder member will receive a copy of the memorial volume, which will contain addresses and papers read before the Congress, and other material of historic and scientific value. Ordinary subscribers attending the celebration may receive copies of the memorial volume at a reduced price. Subscriptions and donations should be sent to the Honorary Treasurer, Mr. Adam Tait, Royal Bank of Scotland, St. Andrew Square, Edinburgh; and all who are interested in this proposed celebration are invited to communicate with the General Secretary of the Royal Society of Edinburgh, 22, George Street, Edinburgh.

The Committee on Morbidity and Mortality Statistics, in their Report to the Council last year (JOURNAL, vol. lxxvi, p. 791), referred to the want of statistics dealing with the work of our hospitals. The subject has been dealt with since that date in *The Hospital* (issues of October 18 and November 1 last), and in *The Lancet* (Editorial, January 31, and Correspondence, February 7). The observations of the Committee are endorsed in both journals, but so far no practical suggestions for remedying the recognised deficiencies have been put forward. Two publications from America bearing on the subject have been received and are of interest. One of them, *The Statistical Experience Data of the Johns Hopkins Hospital, Baltimore*, Md., 1892-1911, by Dr. F. L. Hoffman, incidentally deals with the deficiencies in hospital statistics prevailing in the United States; and the other, *Hospital Morbidity Statistics*, by Dr. C. F. Bolduan, of the New York City Department of Health, submits well-defined proposals for securing complete and trustworthy data. Dr. Hoffman has analysed the admissions (44,263 in all) during the ten years by sex, age, race and causes—the last almost too minutely. He has been able to combine the first three, also causes with sex and race, but—and this is the most serious defect, for which, however, the author cannot be held responsible—there is no combination of cause, sex and age. The text includes much that is stimulating to enquirers, but it is interesting to note how closely the suggestions as to the proper compilation of hospital statistics put forward by the author follow the lines of earlier writers such as Simon and Guy. The book, which contains 161 pp. quarto, includes a copious bibliography. Dr. Bolduan's pamphlet is brief, but very much to the point. His proposals include a draft "Discharge Certificate," which embodies all the information recommended by Simon as long ago as 1863 to be collected, and the use of Hollerith machines for tabulation. He recommends the analysis and tabulation of completed cases only—not admissions; and the specimen tables drawn up provide for distribution of cases by sex, age, race, causes, &c., in useful and instructive combinations. Dr. Bolduan advocates a central office for collecting and handling the hospital statistics of New York. He estimates that data relating to from 100,000 to 150,000 patients would have to be dealt with annually, and the cost of such work, he states, "would probably not exceed $12,000 per annum." He thinks that the cost of preparing an annual return on the lines suggested by him would be less than the present total expenditure on separate reports for each institution, reports which he does not hesitate to characterise as "almost worthless."

The Presidential Address by Dr. Chalmers to the Society of Medical Officers of Health, which has been issued in pamphlet form under the title of *A Page in the Natural History of Pulmonary Tuberculosis*, discusses the reduction in the mortality from pulmonary tuberculosis which has been such a notable feature in the statistics of parts of Scotland during recent years. Dr. Chalmers contends that the reduction has been mainly due to the infusion of new blood through migration. This view certainly appears to be supported by a table he gives, in which the divisions of the country are arranged in three groups, containing respectively 70, 80 and 90 per cent. of "native-born" inhabitants. Comparing the mean mortality from pulmonary tuberculosis observed in each of those groups during 1860-62 with that observed in 1900-02, he finds that the decrease (per cent.) in mortality during the forty years has been greatest in the group with the highest proportion of "non-"native" born inhabitants and least where it is lowest.

In a paper entitled *The Mortality from Phthisis: A Statistical Investigation*, recently read before the Royal Society of Medicine and now reprinted, Dr. Snow attacks another of the many problems of pulmonary tuberculosis. He seeks to answer such questions as—How does personal communicability of phthisis vary with age? Does it vary with sex? Do populations of certain age-groups more readily communicate the disease than do others, and is it more readily communicated to them and others kindred to them? He attacks his problem by selecting a number of rural districts of approximately equal area, and examines the sex-composition of the populations at ages 15–45 and the phthisis mortality. Comparisons are instituted of districts (1) with approximately equal numbers of males and (2) districts with approximately equal numbers of females. In each case the death-rates (20–25) in the opposite sex (the numbers of which varied considerably) were taken out and the variations in the mortality examined. Dr. Snow concludes that "there is definite "evidence that the mortality of young males (15–25) is associated "with excess of females and even of older females; that of older "males (25–45) is associated with excess of younger females, "certainly up to age 20 and probably beyond; that of young "males (15–20) is certainly not associated with excess of older "males; that of males between 20–25, and again between 25 and 35, "is associated with excess of males in combined age-groups in which "the younger ages have most weight; and there is just a hint that "the mortality of males (35–45) is associated with excess of males "(15–20) but not with similar excesses in other groups." He was not able to find any evidence of similar association between the mortality of females and excess of males. Looked at simply as a mathematical calculation, the conclusions appear to be sound, but—as was brought out in the discussion on the paper—it is questionable whether the correlation coefficients should be unreservedly accepted—or rather, whether some further factor not dealt with by the author ought not to be taken into consideration as the real cause of the somewhat high coefficients. A possible factor which naturally occurs to the reader is the cause of the excess female population. Bearing in mind the fact that rural districts have been selected, one is inclined to ask how far the excess in mortality among the male population has been caused by emigration of healthy vigorous males, leaving an excess of females and a disproportionately small weakly stock of males in their proper homes.

A course of six public lectures is being given at the Francis Galton Laboratory for National Eugenics, University College, Gower Street, W.C., commencing with Tuesday, February 10, and on the following five Tuesdays, at 8.30 p.m. The subjects dealt with are "The graduated character of mental defect and the need "for standardising judgments as to the grade of feeble-mindedness "which shall involve segregation" (Professor Karl Pearson), "Some "further points in connection with the fall in the birth-rate" (Miss Ethel M. Elderton), "Infant mortality in a manufacturing "town" (Miss Alice Lee, D.Sc.), "An examination of some recent "studies of the inheritance factor in insanity" (Dr. David Heron), "The handicapping of the first-born" (Professor Karl Pearson), and "Some recent misinterpretations of the problem of nature and "nurture" (Professor Pearson). Admission to the lectures is free, but, owing to the limited accommodation, by ticket only. Applications for tickets should be made to the Hon. Secretary, Galton Laboratory, University College, W.C., and should contain a stamped and directed envelope. It is desired that admission should only be sought to lectures which it is the ticket holder's intention to attend.

We regret to announce the death of Mr. Charles Atkinson, who was elected a Fellow of the Society in 1888, and had been one of the Auditors of the Society's accounts continuously from 1895 to 1913. Mr. Atkinson attended regularly the Ordinary Meetings for the reading of Papers, and, though he seldom joined in the discussions, he showed a keen interest in the Society's proceedings and welfare. His services to the Society will be gratefully remembered. The death of Dr. jur. Gustav Pabst, of the Statistical Bureau of Lübeck, is also announced.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

United Kingdom—

Economic Review. January, 1914—Studies in the industrial productivity of man: *Wilsden (L. W.)*. The social teaching of Ruskin: *Hislop (Gordon)*. The incidence of the insurance tax on British agriculture: *Ashby (A. W.)*. Further notes on some fundamental notions of economics: capital: *Smith (Prof. J. A.)*.

Eugenics Review. January, 1914—Depopulation and eugenics: *March (M Lucien)*.

Financial Review of Reviews. February, 1914—Naval expenditure and the investor: *Byles (Sir William P.)*, M.P. The brewery revival—will it be sustained? *Wright (Arnold)*. Labour troubles and quack remedies: *Good (T.)*.

United Empire (Royal Colonial Institute Journal). January, 1914—Northern Rhodesia: *Gibbons (Lieut.-Col. A. St. Hill)*. Indian immigration in British Guiana: *Stembridge (E. C.)*.

United States—

American Journal of Sociology. January, 1914—Variability as related to sex differences in achievement: *Hollingworth (Leta Stetter)*.

American Statistical Association (Quarterly Publications). No. 104. *December*, 1913—Our coming seventy-fifth anniversary: *Koren (John)*. The census methods of the future: *Durand (E. Dana)*. Comparative fecundity of women of native and foreign parentage in the United States: *Hill (Joseph A.)*. The permanent census bureau: a decade of work: *Cummings (John)*. An experiment in the compilation of mortality statistics: *Dublin (L. I.)* and *Kopf (E. W.)*. The mother tongue inquiry in the census of population: *Goldenweiser (E. A.)*.

France—

Bulletin de la Statistique générale de la France. January, 191—4 Propriété foncière (France, évaluation des propriétés non bâties). Le travail des femmes en divers pays: *Ville-Chabrolle (M. Marcel de)*.

Bulletin de Statistique, Ministère des Finances, 1913—

November—La nouvelle évaluation des propriétés non bâties. Le commerce extérieur en 1912. (France et Algérie.) [Résultats définitifs.] La situation financière des départements en 1909.

December—Les successions déclarées en 1912. Les fabriques de sucre et leurs procédés de fabrication (Campagnes 1903-04 à 1912-13).

FRANCE—*Contd.*

Journal des Economistes. January, 1914—1913-14 : Faits et prévisions : *Guyot* (*Yves*). Le marché financier en 1913 : *Raffalovich* (*Arthur*). Le currency law : *Mondet* (*N.*). La Serbie au lendemain de la guerre : *Muzet* (*Alphonse*). Le second congrès de réglementation douanière : *Senior* (*Testis*). L'extension du réseau ferré en Russie : *Hochschiller* (*Max*).

Journal de la Société de Statistique de Paris. January, 1914—La statistique internationale de l'assurance contre l'invalidité : *Bellom* (*Maurice*). Variété : la statistique et les conditions professionnelles des ouvrières de l'aiguille en Finlande : *Pissargersky* (*Mlle. Lydie de*).

La Réforme Sociale, 1913—

January 16—Le mouvement économique et social : *Angot des Rotours* (*M. le Baron*).

February 1—Les industries rurales en France. Quelques industries purement féminines : *Zeys* (*Mlle. L.*). Le mouvement économique et social : *Lepelletier* (*M. F.*).

Revue d'Économie Politique. January–February, 1914—Réponse aux critiques de M. Turgeon : *Loria* (*Achille*). L'industrie des pêches maritimes françaises, son passé, son présent, son avenir : *Bellet* (*Daniel*). La notion de valeur : *Bodin* (*Charles*). La répartition de la propriété rurale en Autriche : *Gonnard* (*René*). Quel est l'avenir des industries rurales à domicile ? *Olphe-Galliard* (*G.*).

GERMANY—

Archiv für Rassen- und Gesellschafts-Biologie. Heft 4, 1913—Auslesewirkungen bei biologisch-statistischen Problemen : *Weinberg* (*Dr. W.*). Über die Korrelation zwischen Körpergrösse und Kopfindex : *Bresciani-Turroni* (*C.*). Korrelation der Vererbung von Augenleiden (Ektopia lentium cong., Ektopia pupillae, Myopie) und Herzfehlern in der Nachkommenschaft Schleuss-Winkler : *Strebel* (*Dr. J.*). Die Ausbreitung der Geschlechtskrankheiten in Berlin 1892 bis 1910 : *Claassen* (*Dr. Walter*). Über einige "Rassenmerkmale" des jüdischen Volkes : *Kaznelson* (*Dr. Paul*).

Deutsches Statistisches Zentralblatt. October, 1913—Georg v. Mayrs Moralstatistik (*continued in November and December* 1913 *issues* : *Günther* (*Dr. A.*). Zum Problem der Statistik des öffentlichen Gesamthaushalts : *Haselberger* (*J.*).

Jahrbucher für Nationalökonomie und Statistik (*Conrad's*). *January,* 1914—Die Stadtwirtschaft in England : *Brodnitz* (*Georg*). Getreideausfuhrvergütung und nationale Futterbeschaffung : *Beckmann* (*Friedrich*). Zur sozialen Theorie der Verteilung : *Albrecht* (*Gerhard*).

Vierteljahrshefte zur Statistik des Deutschen Reichs. Heft 4. 1913—Zur deutschen Justizstatistik 1912. Zur Kriminalstatistik. Vorläufige Mitteilung für 1912. Schweinezählung 2. Juni 1913.

GERMANY—*Contd.*

Zeitschrift für die gesamte Staatswissenschaft. Heft 1, 1914—Ueber die Entwicklung der Reichsfinanzen bis zur Einführung der ersten direkten Reichssteuern: *Siebert* (*A.*). Die XIV. Tagung des Internationalen Statistischen Instituts zu Wien 1913: *Zimmermann* (*F. W. R.*). Zum österreichischen Entwurfe eines Genossenschaftsregisters: *Deumer* (*Robert*). Die wahre Grundlage der Grösse der britischen Industrie: *Waltemath* (*Kuno*).

Zeitschrift für Socialwissenschaft. Heft 1, 1914—Die Bevölkerungsentwicklung in Irland (*continued in next issue, Heft* 2, 1914): *Prinzing* (*F.*).

ITALY—

Giornale degli Economisti e Rivista di Statistica. January, 1914—L'Uomo medio: *Gini* (*Corrado*). Il principio mutualistico nelle assicurazioni: *Beneduce* (*Alberto*). Sulla perequazione mediante curve unimodali semplici: *Insolera* (*Filadelfo*). Nuove ricerche sulla mortalità italiana: *Mortara* (*Giorgio*). Sopra la teoria delle variazioni di valore della moneta: *Amoroso* (*Luigi*).

La Riforma Sociale. January–February, 1914—Per l'istruzione e l'educazione del popolo italiano: Due esempi notevoli: *Geisser* (*Alberto*). La piattaforma dei partiti di maggioranza nella recente campagna elettorale politica: *Schiavi* (*Alessandro*). La questione della Mediterranea: *Desler* (*Gustavo*). La serrata degli avvelenatori: *Prato* (*Giuseppe*).

Rivista Italiana di Sociologia. September–December, 1913—Alcune relazioni tra lo stato sociale e le variazioni della prosperità economica: *Pareto* (*V.*). Le scienze positive e le scienze storiche: *Xénopol* (*A. D.*). I limiti della statistica: *Ricci* (*U.*). Teoria dell' equilibrio di composizione delle classi sociali: *Sensini* (*G.*).

MONTHLY LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since January 8, 1914, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Belgium—

Labour. Conseil Supérieur du Travail: onzième Session 1911-12. 4to. 1913. (Ministry of Industry.)

Cuba—

Camara de Representantes. Catalogo de las obras que forman su Biblioteca. Secciones de Hacienda publica y de Comercio y Transporte. 8vo. Habana, 1913. (The Librarian.)

Necesidad de crear en Cuba una Secretaria del Trabajo y Reformas Sociales. 16 pp., 8vo. Habana, 1913. ("El Nacional Obrero.")

France—

Census. Recensement Général de la Population, 5 Mars 1911. Tome 1. Part 1. Introduction. Population légale ou de résidence habituelle. Sm. 4to. 1913. (The General Statistical Bureau.)

Germany—

Vierteljahrshefte zur Statistik des Deutschen Reichs. Ergänzungsheft zu 1913, III. Die Ergebnisse der deutschen Produktionserhebungen. 78 pp., 4to. 1913. (The Imperial Statistical Bureau.)

Oldenburg. Statistisches Handbuch für das Grossherzogtum Oldenburg. Teil 1. 8vo. 1913. (The Statistical Bureau.)

Berlin. Census. Die Grundstücks-Aufnahme vom 15. Oktober 1910 sowie die Wohnungs- und die Bevölkerungs-Aufnahme vom 1. Dezember 1910 in Berlin und 44 Nachbargemeinden. Abteilung, 1. Stadt Berlin. Heft 1. Die Grundstücks-Aufnahme vom 15. Oktober 1910. Fol. 1913. (The Municipal Statistical Bureau.)

Italy—

Elections. Statistica delle elezioni generale politiche alla 24 Legislatura. (26 ottobre e 2 novembre 1913.) 8vo. 1914. (The Director General of Statistics.)

Rivista critica di Scienze sociali. Periodico mensile. Anno i. No. 1. 15 Gennaio 1914. 8vo. Firenze, 1914. (The Editor.)

Sweden—

Agriculture. Labour. Arbetartillgång, Arbetstid och Arbetslön inom Sveriges Jordbruk År 1912. 8vo. 1913. (K. Socialstyrelsen.)

United States—

Census Bureau. Special Reports. Financial Statistics of Cities having a Population of over 30,000: 1911. 4to. 1913. (The Bureau.)

Census, 1910. Vol. 3. Population 1910. Reports by States, with statistics for Counties, Cities . . . Nebraska-Wyoming, Alaska, Hawaii and Porto Rico. 4to. 1913. (*Id.*)

Labour. Bulletin of Bureau of Labor Statistics. Whole Nos. 127 and 135. 2 parts. 8vo. 1913. (The Department of Labor.)

New York (State). Labor laws of New York State, 1913. 8vo. 1913. (The State Department of Labor.)

—— The Workmen's Compensation Law of New York State, 1913. 8vo. 1913. (*Id.*)

(a) Foreign Countries—*Contd.*

International—

10ᵉ Congrès International des Habitations à bon marché. La Haye-Scheveningue. Sept. 1913. Rapports 1–3ᵉ Parties. 3 vols. 8vo. Rotterdam, 1913. (Nijgh and van Ditmar's Uitgevers-Mij.)

(b) India and Colonies.

India—

Prices. Variations in Indian Price Levels from 1861 to 1912 Expressed in Index Numbers. 16 pp., fol. Calcutta, 1913. (The Director General of Commercial Intelligence.)

Burma. Gazetteer, for several districts. Volume B, including Town and Village Census Tables. Nos. 9, 20, 21, 22, 23, 29, 30 and 37. 8 vols., 8vo. 1913. (The India Office.)

Central Provinces District Gazetteers. Mandla District. Vol. A. Descriptive. Vol. B. Statistical Tables (1891-1911). 2 vols. 1912-13. (*Id.*)

Canada, Dominion of—

Census of Canada, 1911. Vol. 2. Religions, Origins, Birthplace, Citizenship, Literacy and Infirmities, by Provinces, Districts and Sub-Districts. 8vo. 1913. (The Census and Statistics Office.)

New Zealand—

Government Railways Superannuation Fund; Report by Actuary, showing Results of Actuarial Investigation into Financial Position of the Fund as at 31st March, 1912. 15 pp., fol. 1913. (The Government Life Insurance Department.)

Gilbert and Ellice Islands—

Table showing population of the Islands in 1909 and 1911. 1 sheet MS. (The Colonial Office.)

Malay States—

Kelantan (State). Total population, at Census of 1911. Sheet MS. (The Colonial Office.)

Tongan Islands Protectorate—

Census returns, April 3, 1911. 4 pp., folio MS. (The Colonial Office.)

(e) United Kingdom and its several Divisions.

United Kingdom—

Dominions Royal Commission. Second Interim Report. (Cd-7210.) 1914. (Sir Edgar Vincent.)

—— Minutes of Evidence taken in Australia in 1913. Part 1. (Cd-7171.) Part 2. (Cd-7172.) Minutes of Evidence taken in New Zealand in 1913. (Cd-7170.) 1913. 3 vols. 1913. (*Id.*)

—— Minutes of Evidence taken in London in November, 1913, and Papers laid before the Commission. (Cd-7173.) 1914. (*Id.*)

England and Wales—

Board of Agriculture and Fisheries. Supplement to Journal. January, 1914. Report on possibility of reviving Flax industry in Great Britain. 56 pp., 8vo. 1914. (The Board.)

—— Fishery Investigations. Series 1.—Salmon and Freshwater Fisheries. Vol. 1. 1. Report on Investigations upon Salmon with special reference to Age-determination by study of scales. 2. Report on investigations upon the Smelt (*Osmerus eperlanus*) with special reference to Age-determination by Study of Scales and its bearing upon Sexual Maturity. Fol. 1913. (*Id.*)

(c) United Kingdom and its Several Divisions—*Contd.*

England and Wales—*Contd.*

Census of England and Wales, 1901. Index to Population Tables . . . (Cd-1826.) 1903. (The Registrar-General.)

Census of England and Wales, 1911. Vol. xi. Infirmities. (Cd-7020.) 1913. (*Id.*)

London. Report of London Traffic Branch of Board of Trade. 1913. (Cd-7190.) 1913. Colonel Hellard, Board of Trade.)

—— "Citizen Series" Maps of London showing different areas controlled or administered by the various Government Departments, local authorities and supply companies having statutory powers in and around the city and county of London. 4to. 1914. (G. W. Bacon and Co.)

Ireland—

Education. Irish National Teachers' Pension Fund. Report of Actuaries as to cost of proposed new scheme. (Cd-7205.) 1914. (Purchased.)

Milk. Appendix to Final Report of Irish Milk Commission, 1911. (Cd-7134.) 1913. (*Id.*)

Scotland—

Census of Scotland, 1911. Report on the Twelfth Decennial Census of Scotland. Volume 3. (Cd 7163.) 1913. (The Registrar-General.)

(d) Authors, &c.

Bennett (*E. N.*). Problems of Village Life. (Home University Library.) 256 pp., sm. 8vo. London, 1914. (Williams and Norgate.)

Bernis (*Francisco*). Estudios estadisticos. Contribucion à la Investigacion de la situacion economica de los trabajadores en España. 39 pp., 8vo. Barcelona, 1914. (The Author.)

Black (*F. A.*), F.R.S.E. Perpetual Calendar. Sheet. Inverness, 1914. (The Compiler.)

Cannan (*Edwin*). Wealth. A brief explanation of the causes of economic welfare. xxiii + 274 pp., 8vo. London, 1914. (P. S. King and Son.)

Culpin (*Ewart G.*). Garden City Movement Up-to-Date. 82 pp., 8vo. 1914. (The Garden Cities and Town Planning Association.)

Green (*C. E.*). The Cancer Problem a Statistical Study. 3rd edition. 98 pp., 8vo. 1914. (W. Green and Sons, Ltd.)

Hall (*A. D.*), F.R.S. A Pilgrimage of British Farming. Reprinted by permission from the *Times*. xiii + 152 pp., 8vo. London, 1913. (Purchased.)

Harben (*Henry D.*). The Rural Problem. viii + 169 pp., 8vo. London, 1913 (Constable and Co.)

Hewitt (*Edward G.*) Thousands of tons of money. . . . 35 pp., 8vo. New York, 1913. (Edwin W. Greenhowe.)

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Hopkins (*Chas. P.*). Altering Plimsoll's Mark. 68 pp, 8vo. 1913. (Simpkin, Marshall and Co.)

Jones (*Robert*). Nature and First Principle of Taxation. With Preface by Sidney Webb. xvii + 299 pp., 8vo. London, 1914. (P. S. King and Son.)

Kürten (*Dr. O.*). Statistik des Selbstmordes im Königreich Sachsen. Ergänzungshefte zum Deutschen Statistischen Zentralblatt. Heft 3. viii + 145 pp., 8vo. Leipzig, 1913. (Herrn B. G. Teubner.)

Magee (*James D.*). Money and Prices; a statistical study of price movements. 89 pp., 8vo. Chicago, 1913. (The Author.)

Mertens (*F.*). Militarism and Wages. The effect of Militarism on wages and prices of commodities. 16 pp., 8vo. 1914. (*Id.*)

Nogaro (*Bertrand*) Éléments d'Économie politique. Répartition-Consommation. Doctrines. 291 pp., sm. 8vo. Paris, 1914. (Giard and Brière.)

Pigou (*A. C.*). Unemployment. (Home University Library.) 256 pp., sm. 8vo. London, 1913. (Williams and Norgate.)

(d) **Authors, &c.**—*Contd.*

Snow (*E. C.*). Mortality from Phthisis: A Statistical Investigation. (Reprinted from Proceedings of Royal Society of Medicine, 1913, Vol. VII.) 35 pp., 8vo. 1913. (The Author.)

Struyck (*Nicolas*). Les Œuvres de Nicolas Struyck (1687–1769), qui se rapportent au Calcul des Chances, à la Statistique Genérale, à la Statistique des Décès et aux Rentes Viagères, tirées des Œuvres complètes et traduites du Hollandais, par J. A. Vollgraff. vii + 432 pp., 8vo. Amsterdam, 1912. (The Algemeene Maatschappij van Levenszekering en Lijifrente.)

Supino (*Camillo*). Principi di Economia Politica. quarta edizione. ix + 597 pp. 8vo. Napoli, 1914. (Luigi Pierro.)

Taylor (*W. G. Langworthy*). The Credit System. x + 417 pp., 8vo. New York, 1913. (Macmillan and Co.).

Tillett (*Alfred W.*). Herbert Spencer refutes recent misrepresentations. Professor Bourne's defamatory attacks met by excerpts culled from the philosopher's works. 15 pp., 8vo. London, 1910. (P. S. King and Son).

Usher (*Abbott Payson*). History of Grain Trade in France 1400–1710. Harvard Economic Studies, Vol. IX.) xv + 405 pp., 8vo. Cambridge, 1913. (The Harvard University Press, U.S.A.)

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Wacha (*D. E.*). Indian Currency Commission. Review of principal evidence recorded during the first Session. 112 pp., 8vo. Bombay, 1913. (The Author.)

Watlis (*B. C.*). Nottinghamshire in the Nineteenth Century. The Geographical Factors in the Growth of the Population. (From "The Geographical Journal" for January, 1914.) 61 pp., 8vo. 1914. (The Author.)

Wright (*Sir Robert S.*) and *Hobhouse* (*Rt. Hon. Henry*). An outline of Local Government and Local Taxation in England and Wales (excluding London). 4th edition. vii + 211 pp., 8vo. London, 1914. (Sweet and Maxwell, Ltd.)

Zawadzki (*Wl.*). Les Mathématiques appliquées à l'Economie Politique. 331 pp., 8vo. Paris, 1914. (Marcel Rivière et Cie.)

(e) **Societies, &c. (British).**

Lawes Agricultural Trust. Rothamsted Experimental Station, Harpenden. Guide to Experimental Plots, 1913. 48 pp., 8vo. 1914. (The Trust.)

National Insurance Year-book, 1914. 2nd year. 597 pp., 8vo. London, 1914. (The Insurance Publishing Co.)

Tariff Commission. The New Tariff of the United States and its relation to the trade and policy of the United Kingdom and the British Empire. 35 pp., 4to. 1914. (The Commission.)

Trade of United Kingdom, 1913-1912-1911.—*Declared Real Value (Ex-duty) of* **Imports** *at Port of Entry, and therefore including Freight and Importer's Profit; and the Distribution of* **Exports** *of British and Irish Produce and Manufactures from the United Kingdom, according to their Declared Real Value.*

[000's omitted.]

Merchandise (*excluding Gold and Silver*) Imported from, and Exported to, the following Foreign Countries, &c.	1913.		1912.		1911.	
	Imports from	*Exports to*	Imports from	*Exports to*	Imports from	*Exports to*
—	£	£	£	£	£	£
Russia { Northern ports .... Southern ,, ... }	40,275,	18,116,	40,564,	13,767,	43,136,	13,512,
Sweden	14,214,	8,233,	13,231,	7,132,	11,925,	6,355,
Norway	7,470,	6,148,	6,905,	5,570,	6,259,	4,852,
Denmark*	23,836,	5,790,	22,120,	5,594,	20,577,	5,310,
Germany†	80,511,	40,695,	70,074,	40,377,	65,306,	39,357,
Holland	23,565,	15,477,	21,410,	14,305,	18,674,	13,137,
Java	2,089,	5,713,	5,143,	5,142,	4,653,	4,544,
Belgium†	23,385,	13,263,	23,634,	12,246,	20,819,	11,376,
France†	46,349,	28,957,	45,490,	25,608,	41,636,	24,321,
Portugal†	3,018,	3,273,	2,834,	3,040,	2,880,	2,801,
Spain†	14,389,	7,892,	14,558,	6,894,	13,717,	5,500,
Italy†	8,133,	14,606,	8,236,	14,022,	6,950,	13,276,
Austria-Hungary	7,709,	4,482,	7,019,	4,929,	6,917,	4,686,
Greece	2,143,	2,538,	2,118,	2,568,	2,274,	1,726,
Roumania	20,014,	1,943,	3,262,	2,931,	6,595,	2,691,
Turkey (European and Asiatic) and Crete	5,128,	7,742,	6,417,	8,160,	5,493,	9,457,
Egypt	21,406,	9,807,	25,783,	9,461,	21,487,	10,320,
Philippine Islands and Guam	2,183,	983,	2,159,	1,108,	1,840,	996,
China‡	4,674,	14,848,	4,952,	10,739,	4,898,	12,149,
Japan§	4,388,	14,542,	3,940,	12,192,	3,388,	11,884,
United States { Atlantic ...... Pacific .... }	141,706,	29,309,	134,607,	30,123,	122,701,	27,433,
Peru	3,179,	1,490,	3,298,	1,414,	3,150,	1,387,
Chile	5,315,	6,010,	4,983,	6,165,	4,348,	6,151,
Brazil	10,064,	12,461,	9,382,	12,640,	10,841,	11,928,
Argentine Republic	22,498,	22,627,	40,808,	20,567,	27,293,	18,616,
Other countries	19,514,	33,207,	35,887,	33,680,	31,441,	31,667,
Total—Foreign Countries	577,455,	330,152,	558,844,	310,374,	509,198,	295,462,
BRITISH POSSESSIONS.						
Channel Isles	1,984,	1,353,	1,778,	1,335,	1,739,	1,286,
Nigerian Protectorate	3,891,	3,727,	3,235,	3,577,	2,809,	3,059,
Cape of Good Hope	9,381,	10,824,	8,660,	9,892,	7,314,	8,453,
British India (including Burmah)	48,449,	70,315,	52,165,	57,626,	45,445,	52,292,
Straits Settlements (including Malay States)	19,377,	7,169,	18,204,	5,887,	14,594,	5,021,
Ceylon	7,801,	4,183,	7,198,	2,862,	6,760,	2,522,
Australia	38,068,	31,183,	36,120,	34,865,	39,096,	30,813,
New Zealand	20,338,	10,833,	20,303,	10,382,	17,852,	9,818,
Canada	30,495,	23,724,	26,881,	23,512,	24,596,	19,712,
British West Indies (including Bahamas)	2,138,	2,399,	1,925,	2,592,	1,923,	2,686,
Other Possessions	9,654,	26,299,	9,288,	24,530,	9,233,	23,159,
Total—British Possessions	191,579,	195,309,	186,053,	177,060,	171,361,	158,821,
Total — Foreign Countries and British Possessions	769,034,	525,461,	744,897,	487,434,	680,559,	454,283,

* Including Faroë Islands.

† Excluding Colonies.

‡ Excluding Hong Kong, Macão, and Wei-hai-Wei.

§ Including Formosa.

Trade of United Kingdom, for the Years 1913-1908.—*Declared Value of the Total Exports of* **Foreign** *and* **Colonial** *Produce and Manufactures from the United Kingdom to each Foreign Country and British Possession.*

[000's omitted.]

Merchandise Exported to the following Foreign Countries, &c.	1913.	1912.	1911.	1910.	1909.	1908.
	£	£	£	£	£	£
Russia Northern ports	9,589,	7,992,	8,806,	8,956,	7,383,	7,345,
Russia Southern ,, ...						513,
Sweden and Norway	1,529,	1,439,	1,626,	1,592,	1,314,	1,342,
Denmark*..............................	586,	621,	564,	547,	531,	518,
Germany†..............................	19,878,	19,223,	18,075,	17,943,	14,920,	13,001,
Holland†	5,128,	5,095,	4,722,	5,143,	4,484,	4,291,
Java	46,	31,	37,	23,	24,	22,
Belgium	7,405,	7,361,	7,252,	6,903,	5,872,	5,413,
France†....	11,920,	12,007,	11,159,	11,065,	9,645,	9,506,
Portugal†..............................	662,	594,	584,	562,	455,	539,
Spain†	763,	790,	572,	524,	495,	502,
Italy†	1,014,	999,	1,383,	1,925,	1,133,	1,040,
Austria-Hungary..............................	1,304,	1,219,	1,348,	1,118,	807,	758,
Greece	59,	35,	47,	29,	32,	41,
Roumania..............................	71,	91,	79,	54,	32,	48,
Turkey (European and Asiatic) and Crete	250,	221,	265,	195,	180,	201,
Egypt	160.	153,	147,	166,	160,	245,
Philippine Islands and Guam‡	61,	45,	35,	36,	28,	27,
China ‡..............................	168,	113,	126,	146,	110,	75,
Japan §..............................	296,	240,	257,	272,	267,	227,
United States	30,239,	34,583,	28,560,	30,748,	29,423,	21,177,
Peru	105.	115,	100,	119,	115,	144,
Chile	357,	349,	333,	326,	319,	223,
Brazil	555,	511,	451,	387,	306,	277,
Argentine Republic..............................	803,	774.	717,	624,	499,	536,
Other countries	3,129,	2,773,	2,386,	2,309,	2,196,	1,741,
Total to Foreign Countries....	96,077,	97,374,	89,631,	91,712,	80,730,	69,752,
BRITISH POSSESSIONS.						
Channel Islands	251,	284,	241,	249,	248,	239,
Nigerian Protectorates	219,	291,	262,	244,	222,	236.
Cape of Good Hope	957,	957,	872,	821,	677,	843,
Brit. India (including Burmah)	1,423,	2,148,	1,616,	1,030,	1,116,	1,416,
Straits Settlements (including Malay States)	214.	147,	124,	117,	73,	78,
Ceylon	131,	122,	103,	135,	92,	91,
Australia	3,370,	3,448,	3,655,	3,412,	3,205,	2,720,
New Zealand	943,	795,	793,	751,	729.	746.
Canada	3,511,	3,789,	3,007,	2,945,	2,379.	1,967,
British West Indies (including Bahamas)	394,	398,	459.	470,	367,	378,
Other Possessions	2,166,	2,085,	1,957,	1,890,	1,527.	1,197,
Total to British Possessions	13,579,	14,464,	13,089,	12,064,	10,635,	9,914,
Total to British Possessions and Foreign Countries	109,656,	111,838,	102,720,	103,776,	91,365,	79,666,

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* Including Faroë Islands, Iceland and Greenland.

‡ Excluding Hong Kong, Wei-hai-Wei and Macão.

† Excluding Colonies.

§ Including Formosa.

FOREIGN EXCHANGES.—*Quotations as under,* LONDON *on Paris, Hamburg, Calcutta, and New York and Hong Kong, on* LONDON, *for* **1913.**

1	2	3	4	5		6		7	8		9		10	
				Calcutta.							Price per Ounce.			
DATES. (Tuesdays or nearest Dates.)	London on Paris. Cheques.	London on Berlin. 3 m. d.	London on Vienna. 3 m. d.	London on Calcutta. Demand.		Indian Council Bills. Minimum Price per Rupee.		New York on London. 60 d. s.*	Hong Kong on London. 4 m. d.†		Gold Bars (Fine).		Standard Silver in Bars.	
1913.				*s.*	*d.*	*s.*	*d.*	$	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 7	25·17$\frac{1}{2}$	20·73	24·53	1	4$\frac{5}{32}$	1	4$\frac{1}{16}$	4·82$\frac{3}{4}$	2	0$\frac{7}{8}$	77	9	2	5$\frac{5}{16}$
,, 21	25·18$\frac{3}{4}$	20·72	24·53	1	4$\frac{1}{8}$	1	4$\frac{1}{16}$	4·83$\frac{3}{4}$	2	0$\frac{13}{16}$	77	9	2	5$\frac{5}{16}$
Feb. 4	25·21$\frac{1}{4}$	20·76	24·52	1	4$\frac{3}{32}$	1	4$\frac{1}{32}$	4·83$\frac{1}{2}$	2	0$\frac{5}{8}$	77	9	2	4$\frac{7}{16}$
,, 18	25·22$\frac{1}{2}$	20·77	24·54	1	4$\frac{1}{16}$	1	4	4·83	2	0$\frac{3}{16}$	77	9	2	4$\frac{1}{2}$
Mar. 4	25·25	20·77	24·55	1	4$\frac{1}{16}$	1	4	4·33$\frac{3}{4}$	1	11$\frac{11}{16}$	77	9	2	3$\frac{7}{16}$
,, 18	25·26$\frac{1}{4}$	20·79	24·60	1	4$\frac{1}{16}$	1	3$\frac{31}{32}$	4·82$\frac{1}{4}$	1	11	77	9	2	2$\frac{5}{16}$
Apl. 1	25·25	20·77	24·51	1	4$\frac{1}{32}$	1	4	4·83$\frac{5}{8}$	1	11$\frac{5}{16}$	77	9	2	2$\frac{1}{2}$
,, 15	25·23$\frac{3}{4}$	20·73	24·50	1	4$\frac{1}{16}$	1	4$\frac{1}{32}$	4·83$\frac{1}{4}$	1	11$\frac{5}{16}$	77	9	2	3$\frac{9}{16}$
,, 29	25·20	20·71	24·50	1	4$\frac{3}{32}$	1	4$\frac{1}{32}$	4·83$\frac{1}{2}$	2	0	77	9	2	4$\frac{1}{16}$
May 13	25·20	20·74	24·48	1	4$\frac{3}{32}$	1	4$\frac{1}{32}$	4·86$\frac{1}{4}$	2	0	77	9	2	4$\frac{3}{16}$
,, 27	25·20	20·72	24·48	1	4$\frac{3}{32}$	1	4$\frac{1}{32}$	4·86$\frac{1}{2}$	1	11$\frac{7}{8}$	77	9	2	3$\frac{13}{16}$
June 10	25·22$\frac{1}{2}$	20·73	24·49	1	4$\frac{1}{16}$	1	3$\frac{31}{32}$	4·82$\frac{3}{4}$	1	11$\frac{3}{4}$	77	9‡	2	3$\frac{9}{16}$
,, 24	25·23$\frac{1}{4}$	20·75	24·56	1	4	1	3$\frac{15}{16}$	4·33$\frac{1}{8}$	1	11$\frac{9}{16}$	77	9‡	2	2$\frac{3}{4}$
July 8	25·23$\frac{3}{4}$	20·73	24·59	1	4	1	3$\frac{15}{16}$	4·83$\frac{1}{4}$	1	11$\frac{9}{16}$	77	9	2	2$\frac{13}{16}$
,, 22	25·23$\frac{3}{4}$	20·72	24·59	1	3$\frac{31}{32}$	1	3$\frac{15}{16}$	4·83$\frac{1}{4}$	1	11$\frac{5}{8}$	77	9	2	3$\frac{1}{16}$
Aug. 5	25·23$\frac{1}{4}$	20·73	24·58	1	4$\frac{1}{16}$	1	4	4·83$\frac{1}{8}$	1	11$\frac{3}{4}$	77	9	2	3$\frac{5}{16}$
,, 19	25·23$\frac{1}{4}$	20·73	24·57	1	4$\frac{1}{16}$	1	4	4·83$\frac{1}{8}$	1	11$\frac{7}{8}$	77	9	2	3$\frac{1}{4}$
Sept. 2	25·23$\frac{3}{4}$	20·70	24·50	1	4$\frac{1}{16}$	1	4$\frac{1}{32}$	4·86$\frac{1}{16}$	1	11$\frac{7}{8}$	77	9‡	2	3$\frac{1}{2}$
,, 16 ...	25·23$\frac{3}{4}$	20·72	24·49	1	4$\frac{3}{32}$	1	4$\frac{3}{32}$	4·82	2	0$\frac{1}{8}$	77	9	2	3$\frac{3}{4}$
,, 30 ...	25·23$\frac{1}{4}$	20·72	24·48	1	4$\frac{1}{8}$	1	4$\frac{3}{32}$	4·82$\frac{1}{4}$	2	0	77	9‡	2	4$\frac{1}{2}$
Oct. 15 ...	25·28$\frac{3}{4}$	20·74	24·50	1	4$\frac{3}{32}$	1	4$\frac{1}{16}$	4·85$\frac{5}{8}$	1	11$\frac{15}{16}$	77	9	2	4$\frac{5}{16}$
,, 29	25·28$\frac{1}{4}$	20·75	24·50	1	4$\frac{1}{8}$	1	4$\frac{1}{16}$	4·80$\frac{3}{4}$	1	11$\frac{11}{16}$	77	9	2	3$\frac{3}{8}$
Nov. 12	25·30	20·76	24·50	1	4$\frac{1}{8}$	1	4$\frac{1}{16}$	4·80$\frac{15}{16}$	1	11$\frac{11}{16}$	77	9‡	2	3$\frac{11}{16}$
,, 26 ..	25·30	20·75	24·52	1	4$\frac{1}{8}$	1	4$\frac{1}{32}$	4·81	1	11$\frac{3}{8}$	77	9	2	3$\frac{1}{16}$
Dec. 10 ...	25·31$\frac{1}{4}$	20·75	24·49	1	4$\frac{1}{8}$	1	4$\frac{1}{16}$	4·81	1	11$\frac{5}{16}$	77	9	2	2$\frac{15}{16}$
,, 24	25·31$\frac{1}{4}$	20·76	24·48	1	4$\frac{1}{8}$	1	4$\frac{1}{16}$	4·81$\frac{1}{4}$	1	11$\frac{1}{4}$	77	9	2	2$\frac{5}{8}$

* Wednesdays following. † Fridays following. ‡ Plus brokerage, &c.

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The CENSUS *of the* EMPIRE, 1911.

By SIR J. A. BAINES, C.S.I.

[Read before the Royal Statistical Society, February 17, 1914, the President, Professor F. Y. EDGEWORTH, M.A., F.B.A., in the Chair.]

THE interest which this Society has taken in the enumeration of the people may be said to be, as it were, congenital; and from Dr. Farr—whom we might call the Father-in-law of the English census—onwards we have had a succession of Fellows who have devoted their experience to the improvement of methods of enumeration and to rendering the results of greater statistical value. Nor has their attention been confined to the United Kingdom. The need of more complete statistical information about the population of the Empire has been brought prominently to notice in the Inaugural Addresses of more than one of our Presidents, of whom I need only mention Sir Rawson Rawson and Major Craigie. We have also the masterly review by Mr. Hooker of the scope and details of the census of different countries of Greater Britain up to 1891, a work which has been of recognised service far beyond the limits of the Society, and which it would be well worth while to bring up to date, in view of the improvements introduced since its publication.

As for my own position in respect of this matter, I need only say that experience must have taught the Council that if they call upon me at short notice, as upon this occasion, to take my place at this desk, they will be letting the Society in for a good dose of census. It is more than forty years since I first took an interest in this subject, and that interest has never been entirely dropped. This persistence has, I admit, the inconvenience of probable repetition, as I have neither the time nor the inclination to sit down in cold blood to the *crambe repetita* of all I have written, and I am addicted, I fear, to so-called "autoplagiarism," a vile hybrid, for which, however, I have recent but respectable literary authority. I propose to deal here with the census of the Empire taken in the spring of 1911. It may be remembered that the Committee originally appointed by the Council to consider and put forward suggestions as to the census of this Kingdom was commissioned to extend the field of its labours to other parts of the Empire, with the view of promoting, as far as the conditions allow, uniformity in the main statistical matter that can be collected at a census. The Committee fully recognised the impracticability of complete uniformity in either procedure or scope of inquiry, but it strongly recommended first, that some census, even though not extending beyond the counting of heads, should be undertaken throughout the dominions, except, of course, in tracts where it might be inadvisable politically or administratively impossible to attempt the inquiry. Then, again, we suggested, for regions in which more detail can be obtained, the compilation of a few primary statistical facts of importance in tables more or less uniform, in order that comparison between the different parts of the Empire on these points might be instituted. In their endeavour to make known what are admittedly counsels of perfection, the Committee was gratefully indebted to the suggestions given at the end of the admirable first attempt at a Report on the census of the Empire made by the Registrar-General of England in 1906; but our suggestions certainly stopped short of what appeared to those acquainted with the conditions of many parts of the Empire to be the somewhat ambitious aspirations set forth by the International Statistical Institute.

It is not possible to say with certainty how far the marked improvement in the censuses of 1911 is connected with our propositions. In this country we have the evidence of the Schedule as well as of Papers recently read here, to assure us that our efforts have borne good fruit. The transmission of our report, too, to census authorities in the different colonies and dominions had at least one good result, in bringing to our library the reports and preliminary summaries far more promptly than before, thus enabling us to review the figures very soon after their publication. In regard to the greater detail and uniformity of the tables, which is a notable feature in the general run of the reports, it is prudent not to attribute too much to the action of the Society; for, although the changes are for the most part in accord with our suggestions, the latter are mostly dictated by ordinary statistical common sense, and would thus commend themselves to any one of experience in census work. The larger units of the Empire—Australia, India and South Africa—have but little to learn from us in this respect. Canada works upon the plan adopted in its great neighbour, and in the Crown Colonies and the Protectorates there is so great variety in geographical, social and administrative conditions that uniformity is at present out of the question. Even making allowance for these impediments to perfect enumeration, there are, I must admit, several points, chiefly connected with the compilation, in which useful information collected has not been reproduced, and, less venially perhaps, the degree of uniformity we endeavoured to compass has been needlessly sacrificed, and the returns, accordingly, have to be ruled out of comparative analysis. I here refer mainly to the returns of birthplace, in which want of detail is the principal defect, and to the return of ages, where special local considerations have sometimes dictated a classification other than that by quinquennial groups, now universally recommended where the compilation is not by single years. I may digress a moment, I hope, to point out how grievously the accuracy of the results, especially in regard to age, is diminished by any suspicion that the return may be connected in some way or other with the personal interests of the individual. In Ireland, and to some extent perhaps in Great Britain, the advantages of the year 70 have been appreciated since the Pension Act has been in force, as were previously the mystical virtues of "over 16," not to mention the classic instance of the ladies of what across the Channel used to be termed "entre "deux ages," now, however, softened into "l'age dangereux." In countries where a poll or house tax is levied after a certain age, as in some of the African and West Indian possessions, the specification of that age in the census tables is no check upon a false return, and only leads, if I am not mistaken, to an exaggerated preponderance in the later parts of the return of the sex not liable to the impost. There is, again, the not rare practice of decennial grouping of ages after 20 or 25, and of giving one total for all over, say, 55, which is unusually early for such an expedient. The former defect is, of course, remediable by interpolation, but the results, *experto crede*, are often by no means as satisfactory as they would be where the population knows its ages better or is less disturbed by migration. Finally, whilst on this subject, I may say that some of the reviews of the results are of a high merit statistically, but others merely reproduce in the text the figures given in the tables. Others do not even do that, and in several instances the tables are not totalled. There is no ground for complaint in this, since the work of dealing with the census is often handed over to an official with no taste or experience for it, and already overladen with other administrative duties.

The scope of the census inquiry varies, as stated above, from the mere enumeration of persons, without distinction even of sex, to the elaborate schedules of Australia, India and South Africa. One of the most satisfactory features of the 1911 census is that so few tracts were left altogether out of the operations. The greater number of those omitted are in Africa, with the addition of Borneo and Papua. Altogether, their population, roughly estimated, does not amount to much more than 3 per cent. on the total. The estimates, too, were more carefully made than before, with the result of eliminating some of the exaggerated figures which used to appear annually in official publications. In fact, to quote from one of the West African reports, "The imagination of the native peoples "the forest with spirits, and the imagination of the official peoples "it with men." It is still hard to believe, however, that in Northern Nigeria, where the estimate has fallen from 30 to 9 millions, the latter population should contain 1,698 females to 1,000 males. Can this be attributed to the form of taxation?

In several of the African protectorates, instead of attempting a regular census of the whole tract, sample villages were carefully enumerated, and the results applied to the larger area. This method has often been recommended, as, for instance, by Dr. Kiaer, of Christiania, and others, especially for the collection of agricultural statistics; and if the selection of villages be really typical, and the inquiry limited to the simplest facts, the results may be fairly approximate and good enough for administrative requirements, though statistically sterile. Between these estimates and the full census panoply of the larger dominions is found every grade of detail. It is clear, therefore, that returns including figures for the whole Empire must be confined to a very small number. The Registrar-General's report on the census of 1901 gives proof of this. The field has certainly been enlarged on this occasion, but the sphere of "Imperial totals" is still very restricted. From the statistical standpoint this is a drawback of comparative insignificance, as it is chiefly to the mind of that literary scapegoat, the "general reader" that conviction is borne by vast aggregates of incongruous figures. The social facts brought to light through a census have to be considered with regard for every variety of race, civilization, climate and geographical conditions. In a few cases the total for the Empire is of use as a standard by which local deviations may be measured, though in itself it is typical of no considerable tract. This point is well exemplified in the elaborate reports upon the Indian census, in which, it may be noted, nearly the whole of the statistical work is devoted to the provincial figures, and the total is brought but cursorily under review, as representing a political, not a demographic, entity.

I leave on one side, then, the imposing aggregate of 419 millions odd, with the additional excuse that, irrespective of the consideration above mentioned, the totals available under the main heads with which I am about to deal fall respectively far short of this figure. Birthplace, for instance, is recorded for about 404 millions; colour, or race, for 362 millions only, as the United Kingdom is excluded, along with one of the largest protectorates. Age and civil condition are recorded, for obvious reasons, in still smaller numbers. Nor am I going to dwell, again, upon the density or specific population. First, it is given for the different units, as a whole, in the official year-books, and then also the general average gives but little information as to the real weight of people upon area; and the analysis of detail, such as I have given on former occasions regarding Australia, India and Canada, is too minute a topic for this Paper. It is enough to emphasize the fact that the internal distribution of population in all the larger countries is very irregular.

In entering upon the details of the population, the first subject to attract attention, and, in an Empire like this, the most interesting and characteristic of its conditions, is difference of race or colour. In no census is this feature so prominent as in that of a dominion which includes amongst its subjects representatives of almost every race under the sun. I am tempted to preface my comments upon the figures with a quotation from a poem on Britannia, by one of the Victorian authors, better known by his initials perhaps than by his name:—

"In fact, mankind at large,
  Black, yellow, white and red,
Is given to her in charge,
  And owns her as a Head."—(J.K.S.)

From my compilation under this head, I have left out the United Kingdom. Northern Nigeria and Rhodesia were not enumerated. In parts of the West Indies the distinction of race is not recorded, and in Mauritius only Indians and Chinese are distinguished, the white, black and half-breeds being all shown together. The small communities of blacks in Australia and of Caribs in Guiana and Honduras were not enumerated.

This is a case in which the general total has enough statistical interest to bear quotation. In the following table, the 362 millions in question are given in their proportion to 10,000 of the total:—

	Number per 10,000 of population.			Number per 10,000 of population.	
	Total.	Omitting India.		Total.	Omitting India.
White	389	2,935	Malay	45	346
Mixed	28	192	Polynesians	6	43
Brown	8,470	1,070	Black	658	5,046
Yellow	401	345	Red	3	23

The group entitled brown comprises Western Asiatic as well as the inhabitants of India and Ceylon. The Burmese and Siamese are grouped with the Chinese and the few other Mongoloids in Northern India.

The immense preponderance of the Indian population tends to veil the general significance of the return, and in the second column this item has been omitted, thereby transferring the pride of place to the black man. If the northern part of Nigeria and Rhodesia were included, the numerical weight of this race would be substantially greater, as there would be about 34 millions of them, with 14 millions of whites and only 5 million Indians, of whom 4 are in Ceylon. The fall in the proportion of the yellow man in this column is caused by the withdrawal of the figures for Burma and the Himalayan tracts.

The local distribution of the various races differs a good deal. The American Indian, for instance, is confined to Canada, as no return has been received from Newfoundland. So, too, the Polynesians are not found, except for a few isolated seamen, beyond Fiji, the Tonga Islands, Australia and the Maori districts of New Zealand. The Chinese and allied races are almost as localized, since, though small numbers of them are returned from all parts of the Empire, except portions of Africa, about 60 per cent. of them are in the Malay Peninsula and its neighbourhood, where they are permanently employed in the mines and on rubber plantations. Most of the remainder are at home, so to speak, in Hong-Kong and Wei-hai-wei. Only just over a million of the blacks are found in countries out of Africa, mainly in the West Indies and Guiana, with a sprinkling of the Southern-State variety in Canada. Emigrants from India are spread more widely than any other race, except the white, though not usually in very large numbers. Leaving out India and Ceylon, they are mostly in the Malay Peninsula and in Mauritius, where they constitute the majority of the population. There are also fairly large communities in the West

Indies, especially in Trinidad and Guiana, where the indentured labourer has been till lately encouraged to settle, a policy which has recently been abrogated, as in South Africa. In this last dominion—to the discomposure, apparently, of the local authorities—no less than 150,000 Indians are resident. The Malays in Cape Colony, relics of a considerable settlement in the early part of last century, are the only large community of this race beyond their native countries, and are said to be responsible too for the greater part of the 436,000 half-breeds of South Africa. Elsewhere the mixed blood seems to vary with the white, in harmony to some extent with the length of settlement of the latter. In the West Indies and Guiana, for instance, the half-breed is numerous, and there are more than 100,000 in India. The high proportion in Mauritius is also partly due to many generations of colonisation by Europeans permanently domiciled in the island, and partly to the inclusion of other coloured races, as mentioned above.

There remain the white communities, the pivot of the Imperial situation. These fall into three groups; the first including the Australasian dominions, South Africa, Cyprus—the half-way halt between Europe and Western Asia—and India, where there are 200,000, not out for the good of their health. This group contains about 7 millions of the 14. Canada absorbs but few less, leaving only about 200,000 scattered over the rest of the Empire. The largest single aggregates of these are in Southern Rhodesia (23,600) and the West Indies (31,000). The numbers in the Malay Peninsula and East Africa have increased considerably of late years. Elsewhere they vary from 5,000 down to the gallant little garrison of 19 in Somaliland, of which we heard a good deal last year.

The extent of the white man's burden can be appreciated better if the distribution be shown in its proportional form, as in Table I appended. From this we see that the dream of a white Australia has been substantially realized, as only 117 in 10,000 are of a different colour. It should be noted, though, that half this remnant is yellow. Canada is nearly as white; and here, too, the ubiquitous Mongol is only exceeded proportionately by the indigenous Indian. The number of Maoris and their half-breeds reduces the proportion of the whites in New Zealand below 94 per cent. In Cyprus there is a considerable element of Syrians and other western Asiatics. We then come by a big drop to the little Bermudas, where not much more than a third of the population is white. Another step downward lands us in South Africa, where the 1¼ millions of Africanders and Europeans is side by side with 78 per cent. of Bantu and other coloured people. The proportions then grow less and less. Southern

Rhodesia has 306, grown up within the last few years. The long-colonised West Indies shows only 262—less than the proportion in Fiji; and the high proportion of mixed-breeds, which is only exceeded by that in Mauritius, can scarcely be said to add to the white prestige. Finally, it is well to note that in India the European element, including the army, the whole body of officials, merchants and professionals—men, women and children—amounts to no more than 6 persons per 10,000.

In connection with the position of these small but important outposts of white civilization, I will digress for a moment from the more general aspects of my subject, in order to put forward a few figures which have not, I think, been brought together before, and which throw some light upon the social character of these communities. In the following table, then, I show the age and sex-distribution of a number of isolated bodies of Europeans, amounting in the aggregate to about 80,000 persons:—

	Per 1 000 of population.							
	Under 20.		20—50.			Over 50.		All ages. Females to males.
	Total.	Females.	Total.	Females	Females to males.	Total.	Females.	
Ceylon	204	109	684	239	537	112	40	634
Straits Settlements	199	95	735	182	328	66	22	426
Malay States	166	86	790	177	288	44	14	384
Hong-Kong	309	158	628	237	607	63	22	716
Fiji	287	135	614	187	439	99	30	544
Falkland Isles	367	146	551	109	247	82	21	382
Uganda, &c.	110	51	856	216	337	34	11	385
Southern Rhodesia	295	143	644	180	387	61	17	515
Gold Coast	41	8	929	73	86	40	1	89
Bermudas	378	186	420	227	1,181	202	112	1,107
Barbados	352	177	405	238	1,422	243	154	1,320
St. Helena	504	252	351	201	1,339	145	83	1,153
Total	292	143	597	199	500	111	52	651
England and Wales	399	200	441	230	1,090	160	86	1,068

The selection covers a wide field. The long-established colonies of Barbados and the Bermudas apparently export white male workers as they are known to do their coloured people, and the same can be said of St. Helena. The Falkland Islands are frequented by whaling vessels, which contribute largely to the adult population. Fiji, East Africa, the Malay Peninsula and Southern Rhodesia are examples of the more recent enterprise of the race, and Ceylon may be deemed a typical plantation settlement in the tropics. I give one sample of the white man's grave, in West Africa. The first point which strikes one in these figures is the predominance of adult life, and the comparative paucity of the young, still more of the old. To illustrate this I have added the corresponding figures for this country. The next feature in the table is the low proportion of women. The general average, it will be noted, is considerably raised by the high ratios in the emigrating countries, and in most of the rest there are not half as many women as men. The difference is more striking in the case of the people of working-ages, including the prime of life when each sex is most in need of the help and companionship of the other. In many settlements there is but one woman to every three men. I have not included India, as the military element there makes the proportions altogether abnormal. This brief statement of one aspect of the life of our fellow-countrymen in the tropics will help to show that the domesticity which appeals so strongly to British sympathies is denied to the majority of those whose avocations carry them outside their native zone.

From race I pass to birthplace, as denoting the relative dependence of a country upon recruitment from abroad. Here, again, it is convenient to treat the figures in their proportional form, as is done in Table II, appended. The aggregate of population included amounts to over 404 millions, taking into account the United Kingdom, but showing it apart from the rest of the Empire. Taking the total for what it is worth, $98\frac{1}{4}$ per cent. of the population concerned was indigenous where it was enumerated. Of the $1\frac{3}{4}$ per cent. remaining, about two-fifths were born in countries immediately adjacent to that in which they were at the time of census, and the rest were natives of more remote territory. Of the latter, more than half hailed from the United Kingdom.

Omitting the West and East African returns, in which detail is incomplete, the least reinforcement from abroad is received by India and Cyprus, with the West Indies a bad third. Mauritius, Malta and Ceylon, too, are comparatively self-supporting. The Falkland Islands at the time of the census were entertaining a large and fortuitous company of Scandinavian whalers. Most dependence upon abroad is found in the Malay Peninsula and, of course, Hong-Kong, all of which look to China for the bulk of their labour supply, supplemented, in Malay countries, by India and Java. It is on the latter country, too, that Guiana and Fiji, which import a little more than a quarter of their population, rely. Mauritius, as already stated, is more than half Indian, though a comparatively small number of its inhabitants were actually born in that Dependency. In New Zealand 28 per cent. of the population was born outside the islands, and the Old Country and Australia are the principal contributors. Of the three large dominions, South Africa, with its large black population, has its immigrants in the lowest proportion, though it indents for labour on its neighbours both north and east. About 17 per cent. of the denizens of the Island continent were born beyond its limits, largely in this country, in the United States and on the European continent. Canada, as is well known, shelters considerable numbers of Russians, Galicians, Icelanders and other Europeans, in addition to over 300,000 citizens of the United States and a large draft upon the Mother Country. In regard to the exchange of population with the United States, I can only say that the latter, as usual, gets the better of the bargain as far as numbers are concerned, since 1,205,000, nearly half women, are sent by Canada across the frontier. I offer no general comment upon the recruitment from adjacent territory, as the geographical considerations involved are obvious, and the economical well known. The interchange of population between one part of the Empire and another can be roughly found by subtracting from the total born in each unit the number enumerated there. I have worked out these figures, but am not burdening the Paper with them, as most of the emigrants go no further than the vicinity of their birth-country, except those from India, Canada and Australia, who are widely spread. The only feature which is worth noticing here is the dispersion of those born in the United Kingdom and enumerated elsewhere in the Empire; these amount to just under 2 millions. Canada shelters 40 per cent.; Australia, 30; 12 per cent. are in New Zealand, 9 in South Africa and 6 in India. Thus only about 64,000 are left for the rest, and a good many of these are in Gibraltar and Malta. Proportionally to the population of the country, natives of this Kingdom bulk largest in New Zealand, 21·4 per cent. In Australia they are 13·4, and in Canada about 11 per cent. They still constitute about a fifth of the population of the Falklands and St. Helena.

In concluding my review of this part of the subject, I may call attention to the relative proportions of the British and foreign-born, which are, in the aggregate, 99·3 and 0·7 per cent. It is only in the Malay Peninsula and in tracts like Hong-Kong, Gibraltar and Honduras, which are closely connected geographically with foreign territory, that the latter form an appreciable element. Of the more independent countries, Canada imports relatively most from non-British sources, and below it, at a long distance, come South Africa, Australia and the Bermudas, the last-named being, I believe, a sort of health resort from the Eastern States of North America. In the United Kingdom, I may remark in passing, the percentage of the foreign-born is higher than the general average, but would fall below it were we to exclude India from the latter.

I now leave the relations of the States and Colonies to each other and to the foreigner in regard to race and nativity, and come to the more personal part of the census inquiry, beginning with the relative proportions of the sexes, in which the variety throughout the Empire is, as is to be expected, greater than that found in the case of either of the topics hitherto discussed. In the following table the countries are arranged in the serial order of the proportion of females to males among their inhabitants :—

Country.	Females to 1,000 males.	Country.	Females to 1,000 males.
North Nigeria	1,698	Gambia Protectorate	980
Barbados	1,449	South Africa (black)	970
Leeward Isles	1,307	Cyprus	967
Nyassaland	1,259	India	953
Bahamas	1,244	Newfoundland	952
Swaziland	1,231	British Guiana	926
Windward Isles	1,213	Australia	926
Uganda	1,211	Trinidad	912
Basutoland	1,197	Mauritius	903
Gibraltar (civil)	1,176		
South Nigeria	1,166	South Rhodesia	899
		New Zealand	896
Channel Isles	1,128	Ceylon	888
Bermudas	1,094	Wei-hai-wei	887
Jamaica	1,092	Canada	886
England and Wales	1,068	South Africa (whites)	863
Scotland	1,062	Sierra Leone (colony)	840
Ireland	1,003	North Borneo	812
Malta (civil)	1,003		
		Fiji	744
Bechuana Protectorate	999	Hong-Kong	542
Siam States	997	Straits Settlements	528
Gold Coast Protectorate	988	Malay States	429
British Honduras	986	Falkland Isles	382

That proportion ranges, it appears, from the very doubtful 1,698 per mille in South Nigeria to the exceptional dearth of the fair sex in the Falkland Islands, which is explained, as above stated, by the presence of a number of whaling vessels. A general average is out of place in these conditions, but, for the sake of illustration, not comparison, I here use the figure 1,038 per mille, which was that of Western Europe in 1901, as found by me for a paper I read here four years ago. That figure is exceeded in sixteen of the countries on the list, and is not nearly reached in the rest. I must not assume that all the ratios here quoted are correct; for, setting aside the preposterous proportion in North Nigeria, it is not at all improbable that in other of the more primitive parts of our African Protectorates, adult males, liable to taxation, are coy of putting themselves forward when an official inquiry is in progress. On the other hand, in India and some other Oriental countries the presence of women, especially young ones, in the recesses of the dwelling is not considered a matter with which the Government has anything to do. Taking the return as it stands, however, it will be found that there is generally a fairly adequate explanation of the proportions, at the extremes, at least, of the list. For instance, in the West Indies, there has been, as is well known, an extensive exodus of men to the works on the Panama Canal, whilst the mines of South Africa similarly attract the adult males of Basutoland and Swaziland. In this country, also, emigration has some effect upon the sex proportions, though in Ireland, as the Registrar-General lately told us, there has been of late a tendency for women, as well as men, to seek work in the United States. In the case of the Malay Peninsula, the immigration of Chinese, Javanese and Indians accounts for the small proportion of women. Amongst the first-named, indeed, in the Malay States, there are only 187 women to every 1,000 men. Hong-Kong is, of course, dependent on the mainland for its labour supply. Trinidad, Guiana and Fiji, too, have their settlements of Indians who, like those in South Africa, bring comparatively few women with them. In Mauritius and Ceylon the Indian immigrant is more of a family man. In the White Dominions, again, the proportion of women is decidedly low. South Africa, with its large mining industry, which outweighs the large domiciled population, stands at the bottom of the list.

The influence of a special movement like that of migration can be traced more clearly when the sex-distribution at different ages is given. I have added, therefore, a table (No. III), showing the number of females per 1,000 males at 7 age-groups. The most instructive of these groups for the present purpose is that between 20 and 44 years of age, into which most of the migrants tend to fall. Unfortunately, the age returns are not available for the African territories in which women appear to be in so great a majority. If we had them, the mystery of this Hamitic feminism might perhaps be solved. I may remark in passing, that in none of the countries of Greater Britain do we find that continuous increase in the proportion of women from infancy to old age that is so remarkable a feature in the return for Western Europe.

Closely allied to the proportion of women in a community is the question of the relative prevalence of marriage and celibacy. In treating of this, however, the distribution of the population by age is a leading factor. I must therefore devote a little comment to the latter, although a subject involving so much study of detail cannot be handled in a paper of this sort otherwise than superficially. The returns, as I said above, are decidedly better than those of previous censuses, and a good many of them can be combined into uniform groups of ages, whilst a few others have been brought into harmony with the rest by a little ordinary adjustment. One or two, however, mostly in the West Indies, take the sixth year into the earliest group, and proceed in quinquennial periods from that point, which throws out comparison with other more orthodox tables. In Table IV appended, I have shown the ages in the usual proportional form, at 7 periods, not altogether identical, I regret to say, with those defined by the melancholy Jaques, of which the later do not quite fit in with modern statistical requirements. The table shows the principal features of the distribution of the inhabitants of each country by age, and the differences in this respect between the various parts of the Empire. In order to facilitate comparison, a standard is necessary by which the local deviations may be measured. The "Imperial total," which here exceeds 379 millions, is added to the table, but, as was stated in connection with Race, the 312 millions of India swamp the variety of the smaller units. I have therefore betaken myself again to the figures for Western Europe, which are reproduced at the foot of the table. The general lines of this standard distribution are doubtless familiar, but I should point out, before applying the table to the census returns, that the standard ages from 55 onwards bear a higher proportion to the total than in any part of Greater Britain, and, indeed, than in this kingdom, were it not for the extraordinary incursion of the aged into Ireland before the last census.

The 30 countries mentioned in the age-table fall into 6 groups: (1) the United Kingdom; (2) the White Dominions and Colonies; (3) India, Ceylon and Mauritius; (4) the Malay Peninsula and Hong-Kong; (5) The Black population of our African possessions; and (6) the West Indies and their British neighbours in America. The total deviations in each group from the standard, both above and below, are, of course, very considerable, and average, on the whole, 784 on a base of 10,000 of the total population. The least mean deviation is, of course, in the United Kingdom, where it is ± 280.

The White dominions reach 491, and the maximum of ± 1,842 is found in the immigrant-laden Malay Peninsula and Hong-Kong. It may be pointed out that the deviation is generally the result of abnormal differences at certain age-groups only, not confined to any particular part of the distribution, except in the case above mentioned, of the general deficiency of the aged. If the plus and minus deviations of each group be taken separately for each age-period, the result indicates fairly the general differences between the distribution of these very diverse populations as a whole, and that of the long-established and highly organised civilisation of Western Europe. To put it briefly, the average net differences per 10,000 are as follows:—

Age.	M.	F.	Total.	Age.	M.	F.	Total.
0— 4 ...	+ 67	+ 91	+158	55—64	−113	−142	−255
5 – 14....	+226	+115	+341	65, &c.	−136	−171	−307
15—19....	− 24	− 55	+ 79				
20—44 ...	+211	+ 74	+285				
45—54....	− 40	−103	−143	Total....	+191	−191	±784

The main difference, accordingly, is in the high proportion borne by the young and those of working age in the newer countries, and the unusually low proportion there of the people past middle life. The very young are most prominent in the West Indies and South Africa, the latter being the only Dominion where the proportion of white children is not unusually low. I ought to mention here that the age-returns for Canada have not yet reached us, and their absence is much to be regretted in connection with this question. At the school-going ages our own country and Australasia show up badly, but the Black and Brown elements of the Empire are well to the fore. In the case of the Malayo-Chinese communities, the enormous preponderance of male immigrants between 20 and 45 reduces the proportions of other age-groups to comparative insignificance. As to this period of the prime of life, the average excess denoted by the figure 285, comprises 74 per cent. of men and only 26 of the other sex. In the West Indian group, however, excluding Trinidad and Guiana, the proportion of men at this period falls more below the standard than that of women rises above it, but everywhere else the reverse is the case, except in this country, where 64 per cent. of the deviation above standard falls to the share of the women. In regard to the senescent and the sexagenarians, the relative paucity is in some cases obviously due to the superabundance of those at earlier ages. In other tracts, the people do not know much of the higher numbers, whether applied to age or to any other fact of everyday life, and in others again, as in India, there is no doubt a really shorter period of old age. The extension of life in this country during the last generation or so is well known, and the old women of Malta, Gibraltar and Barbados seem to be catching up ours.

I have left myself but little space for the consideration of the figures relating to marriage, which are, indeed, less susceptible of comparison than any of the rest, and have been compiled, moreover, less uniformly than any others. There is also this to be said, that marriage does not mean the same thing all over the Empire; nor, again, does it occupy the same position in social life. For instance, in most of the West Indies, coloured men and women live together maritally in probably much the same proportions as elsewhere; but the marriage ceremony is not popular, and, if we were to judge by the census returns, the islands would appear to be in a parlous state as regards connubial bliss. In Guiana, on the other hand, there is said to be an inclination to return concubinage as marriage. In Mauritius, again, marriage is illegal under 18 for men and 15 for women, and the religious ceremony is not recognised unless the union be civilly registered. The Indian immigrant cares for none of these things, but marries under his caste rules. Many of the mixed or general population also ignore registration, and contract stable connections without it. For most of the negro populations no return of marriage was asked for at the census, as it is considered safe to assume that every girl is married as soon as she reaches womanhood. In India, as is well known, the marriage ceremony is generally what would be here deemed betrothal, a fact which has a somewhat startling effect when age is combined with civil condition on paper. But in Burma and Ceylon, custom is more in accord with that of the West.

The proportion of children, as already remarked, varies so greatly that a return of civil condition irrespective of age conveys little information as to the relative prevalence of marriage in the different countries. Unfortunately, the detail of age is wanting in many of the tables, including those for Canada. I append, however, Table V, in which all below 15 have been omitted, and the proportions taken on the rest. The special local characteristics mentioned above are fairly well shown in the figures. In the West Indies, for example, the Bahamas are the only group in which the married of either sex reach a moderately high proportion, and it is the bachelor, apparently, who seeks the Canal. In Mauritius no more than from 20 to 22 per cent. of either sex are set down as married, but it would seem as though the concubine, upon the death of her partner, has a tendency to assume the honorary rank of widow, like the "step on retirement" in the Army!

The highest proportion of married are, as is to be expected, in India, where, too, the widows constitute more than a quarter of the women over 15, in consequence of the prohibition of remarriage amongst the better-off castes. It should be noted that between 25 and 35 only 20 per mille of the Indian women are single, and this falls to half a few years later. In this country the corresponding proportions are 355 and 196 per mille. Here, too, the bachelors between 25 and 35 number 385 per mille, whilst in the Dependency they are only 139; from this period onward they are outnumbered by the widowers. Under 15, 15½ per cent. are wives, but the acme of marriage prevalence among the women of India is reached between 20 and 25. Widows predominate after 45, and constitute 85 per cent. of their sex over 65, whereas in this country they are then only a little more than half. But here, 12 per cent. are still spinsters, and in India no more than 1½. It will be seen that Cyprus again justifies the position I before assigned to it, of a half-way halt between East and West. More than half the women between 20 and 25 are married, and wives are at their maximum proportion between 25 and 35. The men, however, though connubially disposed beyond the average, keep closer to the Western habit, and one of the results of this distinction is a lot of middle-aged widows and comparatively few widowers.

As to the white Dominions, there are relatively fewer husbands in Australasia and South Africa than in Great Britain, and fewer widowed, but more wives. The women of South Africa, too, marry a good deal earlier, and the proportion of the married of both sexes continues high to a later age. But the widows get proportionately more numerous after 50, and the high proportion of wives is kept up by the comparatively small number of spinsters. Throughout the working-period the immigrant bachelor keeps the ratio of his order well above the British figure, though below that of Australia and its neighbour.

I have now reached the end of the subjects I proposed to review, and, as far as can be compassed in a paper of this length, I have accomplished, I hope, to some extent, my main object, which is to make use of the census in calling attention, not to the size and population of the Empire, but to the astounding variety of social conditions therein prevailing, in their numerical aspect. Our knowledge in this direction is still far from complete or even adequate, but we, as a Society, have not spared our efforts in the past, and I trust we shall not fail to continue our endeavours to increase this knowledge, and in this way to bring home to our fellow-citizens the real significance of the often quoted question, "What do they know of England who only England know ?"

TABLE I.—*Colour, per* 10,000 *of population.*

Country.	White.	Mixed.	African.	Asiatic.			American.	Polynes.
			Black.	Brown.	Malay.	Yellow.	Red.	
Australia	9,883	33	1	14	5	59	—	5
New Zealand	9,367	66	—	—	—	24	—	543
Fiji	266	172	—	2,887	—	23		6,652
Tonga Islands	72	45	—	—	—	—	—	9,883
Cyprus	7,928	—	—	2,072	—	—	—	—
Canada	9,771	—	24	3	—	52	150	—
Bermudas	3,523	—	6,477	—	—	—	—	—
West Indies	262	1,891	7,231	598	—	18	—	—
British Guiana	133	1,362	4,112	4,274	—	89	—	—
India	6	3	—	9,581	—	410	—	—
Ceylon	21	65	—	9,879	31	1	—	—
Straits Settlements	104	114	—	1,160	3,395	5,227	—	—
Malay States	29	22	1	1,481	4,356	4,111	—	—
Siam States	3	1	—	102	8,999	895	—	—
North Borneo	17	3	3	45	8,670	1,262	—	—
Hong-Kong	121	56	—	68	9	9,746	—	—
Wei-hai-wei	14	—	—	—	—	9,986	—	—

TABLE I *Contd.—Colour, per* 10,000 *of population.*

Country.	White.	Mixed.	African.	Asiatic.			American.	Polynes.
			Black.	Brown.	Malay.	Yellow.	Red.	
Mauritius	—*	3,435	—	6,471	—	94	—	—
Uganda	1	—	9,991	8	—	—	—	—
East African Protectorate	13	—	9,937	50	—	—	—	—
Nyassaland	8	—	9,987	5	—	—	—	—
Somaliland	1	—	9,914	85	—	—	—	—
South Rhodesia	306	20	9,662	11	1	—†	—	—
South African Union	2,137	730	6,842	252	36	3	—	—
Swaziland	8	14	9,878	—	—	—	—	—
Basutoland	35	32	9,933	—	—	—	—	—
Bechuana Protectorate	135	—	9,836	29	—	—	—	—
Gambia	20	—	9,971	9	—	—	—	—
Gold Coast	11	—	9,989	—	—	—	—	—
Sierra Leone	6	1	9,991	2	—	—	—	—
South Nigeria	3	—	9,997	—	—	—	—	—
Total	389	28	658	8,470	45	401	3	6
Without India	2,935	192	5,046	1,070	346	345	43	23

* Included with Mixed.

† Included with Malay.

TABLE II.—*Birthplace, per 10,000 of population.*

Country.	Indigenous.	Adjacent countries.		Remote countries.				Total Foreign born.
		British.	Foreign.	United Kingdom.	Other British.	Foreign, white countries.	Foreign, others.	
Gibraltar, total	5,536	—	1,232	2,841	315	68	8	1,308
Malta, civil	8,990	—	128	782	33	36	31	195
Cyprus	9,898	—	79	12	2	9	—	88
Canada	7,799	21	422	1,089	46	562	61	1,045
Bermudas	8,330	—	—	774	320	470	106	576
West Indies	9,477	7	65	28	382	16	25	106
British Guiana	7,394	415	—	82	2,023	41	45	86
British Honduras	8,218	205	1,453	46	27	40	11	1,504
*Falkland Isles**	434·3	—	10·4	206·6	10·1	338·6	—	349
India	9,979	9	6	4	1		1	7
Ceylon	8,839	1,147	—	10	3		1	1
Straits Settlements	4,452	1,109	360	60	19	16	3,984	4,360
Malay States	3,393	2,036	691	18	19	2	3,841	4,534
Siam States	8,406	749	102	1	7	—	735	837
North Borneo	8,050	77	1,793	17	46	—	17	1,810
Hong-Kong	3,303	—	6,551	46	69	27	4	6,582
Wei-hai-wei	9,918	—	62	13	2		5	67

* Below 10,000.

TABLE II *Contd.—Birthplace, per* 10,000 *of population.*

Country.	Indigenous.	Adjacent countries.		Remote countries.				Total Foreign born.
		British.	Foreign.	United Kingdom.	Other British.	Foreign, white countries.	Foreign, others.	
Mauritius	8,935	—	6	39	931	10	79	95
East Africa	9,966	—	—	4	28	2		2
West Africa	9,984	—	11	1	2	2		13
South African Union	9,023	191	202	305	175	98	6	306
South Rhodesia	9,516	213	90	125	26	18	12	120
*St. Helena**	954·3	—	—	23·3	17·2	5·2	—	5·2
Australia	8,297	76	—	1,338	44	177	68	245
New Zealand	7,157	472	—	2,141	42	155	33	188
Fiji	7,274	548	—	63	2,100	14	1	15
Total	9,825	38	30	55	11	16	25	71
England and Wales	9,645	205	33	—	46	66	5	104
Scotland	9,172	715	6	—	38	68	1	75
Ireland	9,643	293	5	—	21	36	2	43
Islands	7,843	1,491	517	—	92	57	—	574
United Kingdom	9,861	—	29	—	42	68	—	97

* Below 10,000.

TABLE II (*a*).—*Birthplace.*

British-born.		
Birth-country.	Total.	Enumerated outside birth-country.
United Kingdom	46,373,791	1,973,246
Gibraltar and Malta	234,493	15,371
Cyprus	271,527	228
India	314,143,591	1,359,939
Ceylon	3,649,918	20,263
Straits Settlements	386,938	69,104
Malay States	417,882	14,395
Siam States	381,981	18,185
North Borneo	184,379	16,793
Hong Kong	148,204	3,732
Wei-hai-wei	146,840	—
Asiatic Colonies unspecified	267	267
Mauritius	360,910	3,999
South African Union	5,414,514	26,001
Swaziland	21,876	21,876
Basutoland	76,043	76,043
Bechuana Protectorate	5,364	5,364
Southern Rhodesia	738,750	5,541
Uganda	2,840,623	—
East African Protectorate	2,395,435	—
Nyassaland	12,242	12,242
Gambia	115,325	—
Gold Coast	1,494,598	—
Sierra Leone	1,398,014	—
Southern Nigeria	7,856,605	—
West Africa unspecified	1,170	1,170
South Africa unspecified	12,662	12,662
African Colonies unspecified	1,327	1,327
St. Helena	5,631	2,333
Canada	5,647,673	27,991
Newfoundland	16,883	16,883
Bermudas	15,776	18
West Indies	1,531,005	16,646
British Guiana	221,785	3,080
British Honduras	32,807	2
Falkland Islands	1,421	—
Australia	3,758,156	90,484
New Zealand	805,891	41,632
Fiji	102,913	1,435
Tonga Isles, &c.	7,093	7,093
British unspecified	42,851	—
TOTAL BRITISH	408,275,174	—

Foreign-born.	
Birth-country.	Total.
Austria-Hungary	146,383
Belgium	15,914
Denmark, &c.	27,276
France	73,711
Germany	162,184
Holland	20,019
Italy	74,171
Greece	9,450
Norway	36,142
Portugal	7,270
Russia	253,482
Spain	9,566
Sweden	44,646
Switzerland	15,973
Rumania, &c.	14,114
Turkey in Europe	7,095
Europe unspecified	9,598
Arabia, Persia, &c.	136,742
China	1,218,725
Japan	19,193
Macas	5,380
Philippines	5,902
Siam	8,610
Java, &c.	114,744
Asia unspecified	2,996
Egypt	1,347
Mozambique	122,787
North Africa unspecified	1,433
West Africa (foreign)	7,259
Africa unspecified	17,494
United States	372,403
Central and South America	19,951
West Indies (foreign)	3,242
America unspecified	5,002
Foreign unspecified	16,648
TOTAL FOREIGN	3,006,942
Total returned	**404,282,116**
At sea	14,738
Unspecified	2,139,541
Grand Total	406,436,395

TABLE III.—*Number of females per* 1,000 *males in each age-group.*

Country.	All ages.	0—4.	5—14.	15—19.	20—44.	45—54.	55—64.	65 and over.
England and Wales	1,068	991	1,003	1,015	1,095	1,081	1,116	1,321
Scotland	1,062	988	989	982	1,084	1,094	1,127	1,450
Ireland	1,003	974	968	969	994	989	1,051	1,157
Australia	926	967	979	977	828	801	814	903
New Zealand	896	965	961	973	878	839	775	726
South Africa (whites)	863	970	978	966	776	752	774	884
Malta (civil)	1,003	951	967	1,054	1,018	1,028	1,009	1,032
Gibraltar (civil)	1,176	1,023	1,033	1,187	1,193	1,133	1,456	1,760
Cyprus	967	971	940	1,009	1,008	941	901	850
India	954	1,031	891	929	969	916	1,036	1,052
Ceylon	888	949	912	949	872	872	692	729
Straits Settlements	528	1,018	952	679	378	424	629	
Malay States	429	973	868	621	301	279	438	
Siam States	997	1,016	965	1,078	1,009	889	1,024	
Hong-Kong (Chinese)	551	954	971	413	423	541	766	1,278
Mauritius	901	992	947	996	855	809	783	914

TABLE III *Contd.—Number of females per* 1,000 *males in each age-group.*

Country.	All ages.	0—4.	5—14.	15—19.	20—44.	45—54.	55—64.	65 and over.
South Africa (coloured)	970	1,067	955	994	895	997	1,147	1,298
Basutoland	1,197	1,112	983	1,366	1,524	1,201	1,083	1,007
Gambia (Colony)	884	928	1,017	707	752	1,110	1,109	
Sierra Leone (Colony)	840	1,008	917	918	743	781	958	1,312
Jamaica	1,092	1,006	990	1,078	1,169	1,159	1,148	1,356
Barbados	1,449	1,017	1,003	1,230	2,187	1,676	1,602	2,081
Bahamas	1,244	1,067	996	1,424	1,611	1,212	1,097	1,199
Grenada	1,194	1,000	981	1,184	1,515	1,171	1,266	1,503
St. Vincent	1,283	1,004	985	1,047	1,731	1,481	1,468	1,460
Dominica	1,223	1,017	1,085	1,147	1,336	1,684	1,480	1,526
Santa Lucia	1,178	973	992	1,211	1,473	1,233	1,216	1,141
Trinidad	913	984	972	1,049	874	754	838	1,000
British Guiana	926	1,006	970	1,100	876	784	923	1,177
British Honduras	986	1,055	958	1,094	946	889	989	1,324
Standard population (*Western Europe*, 1901)	1,038	987	990	1,011	1,045	1,074	1,107	1,182

TABLE IV.—*Age-distribution per* 10,000 *of both sexes.*

Country.	0—4.		5—14.		15—19.		20—44.		45—54.		55—64.		65 and over.		Total.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
England and Wales	537	532	996	999	459	466	1,850	2,026	470	508	301	336	224	296	4,837	5,163
Scotland	563	556	1,060	1,048	490	481	1,775	1,924	448	490	292	329	222	322	4,850	5,150
Ireland	503	490	1,001	969	489	474	1,769	1,759	451	446	314	330	466	539	4,993	5,007
Australia	603	583	1,005	984	512	500	2,022	1,875	544	436	279	227	226	204	5,191	4,809
New Zealand	596	575	996	965	445	433	2,229	1,957	441	370	293	227	274	199	5,274	4,726
South Africa (white)	738	716	1,109	1,085	501	484	2,237	1,736	428	322	226	175	129	114	5,368	4,632
Malta (civil)	618	588	1,096	1,060	496	523	1,728	1,759	465	478	341	344	248	256	4,992	5,008
Gibraltar (civil)	443	453	875	904	465	552	1,900	2,267	467	529	274	399	171	301	4,595	5,405
Cyprus	681	661	1,228	1,155	456	460	1,710	1,723	456	429	314	283	240	204	5,085	4,915
India	679	700	1,304	1,162	434	403	1,946	1,885	416	381	221	229	116	122	5,118	4,882
Ceylon	760	721	1,365	1,245	433	411	2,003	1,746	366	319	237	164	133	97	5,297	4,703
Straits Settlements	385	392	835	795	476	323	3,930	1,487	585	248	334	210	—	—	6,545	3,455
Siam States	671	682	1,331	1,285	386	416	1,901	1,918	350	311	370	379	—	—	5,009	4,991
Malay States	447	435	764	663	417	259	4,396	1,322	662	185	313	137	—	—	6,999	3,001
Hong-Kong (Chinese)	303	289	793	770	715	295	3,720	1,573	573	310	248	190	97	124	6,449	3,551
Mauritius	633	628	1,202	1,138	511	509	2,106	1,801	430	348	240	188	139	127	5,261	4,739

TABLE IV *Contd.—Age-distribution per* 10,000 *of both sexes.*

Country.	0—4.		5—14.		15—19.		20—44.		45—54.		55—64.		65 and over.		Total.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
South Africa (blacks)	732	781	1,301	1,212	515	512	1,915	1,713	312	311	170	195	131	170	5,076	4,924
Basutoland	883	982	1,550	1,524	432	590	1,150	1,753	239	287	156	169	142	143	4,552	5,448
Gambia (Colony)	500	464	1,051	1,069	560	396	2,504	1,883	390	433	403	447	—	—	5,308	4,692
Sierra Leone (Colony)	384*	387	1,036	950	535	491	2,586	1,921	493	385	262	251	138	181	5,434	4,566
Jamaica	689	693	1,308	1,295	463	499	1,629	1;905	333	386	209	240	149	202	4,780	5,220
Barbados	576	586	1,292	1,296	504	620	991	2,174	333	558	249	399	136	283	4,081	5,916
Bahamas	687	733	1,395	1,389	458	652	1,188	1,914	345	418	228	250	156	187	4,457	5,543
Grenada	730	730	1,438	1,411	499	591	1,259	1,907	304	356	184	233	143	215	4,557	5,443
St. Vincent	735	738	1,072	1,056	636	666	1,186	2,053	293	434	220	323	239	319	4,381	5,619
Dominica	852*	867	1,147	1,215	488	560	1,122	1,900	256	431	196	290	137	209	4,498	5,502
Santa Lucia	827*	805	1,301	1,291	511	619	1,274	1,877	283	319	201	248	192	219	4,592	5,408
British Guiana	491	491	1,116	1,083	380	418	2,340	2,051	486	381	218	229	130	153	5,191	4,809
British Honduras	694	732	1,271	1,217	481	526	1,871	1,773	387	311	190	188	139	184	5,036	4,964
Trinidad	617	607	1,096	1,065	428	449	2,241	1,962	463	349	234	196	145	145	5,227	4,773
Total	661	677	1,261	1,140	410	414	1,948	1,890	422	393	232	240	134	148	5,098	4,902
West Europe, 1901	594	586	1,035	1,025	464	469	1,737	1,816	462	496	315	382	270	319	4,907	5,093

* Under 6 years.

TABLE IV (*a*)—*Age-deviation per* 1,000 *from standard* (*West Europe*).

Group.		0—4.	5—14.	15—19.	20—44.	45—54.	55—64.	65.	Total.
United Kingdom	M.	− 58	− 31	+ 1	+ 97	+ 4	− 44	− 23	− 54
	F.	− 56	− 24	=	+ 173	+ 5	− 47	+ 3	+ 54
	Total	−114	− 55	+ 1	+ 270	+ 9	− 91	− 20	± 280
White Dominions	M.	+ 35	− 16	+ 34	+ 345	+ 42	− 71	− 53	+ 316
	F.	+ 22	− 17	+ 18	+ 37	− 88	−158	−130	− 316
	Total	+ 57	− 33	+ 52	+ 382	− 46	−229	−183	± 491
India, &c.	M.	+ 86	+270	− 30	+ 210	− 47	−123	−153	+ 213
	F.	+114	+138	− 65	+ 67	−116	−154	−197	− 213
	Total	+200	+408	− 95	+ 277	−163	−277	−350	± 885
Malaya, &c.	M.	−169	−196	+ 18	+2195	+136	− 33	−254	+1697
	F.	−167	−252	−172	− 353	−261	−194	−298	−1697
	Total	−336	−448	−154	+1842	−125	−227	−552	±1842
Africa	M.	+145	+280	+ 45	+ 129	−153	−175	−138	+ 133
	F.	+205	+233	+ 49	− 96	−185	−188	−151	− 133
	Total	+350	+513	+ 94	+ 33	−338	−363	−289	± 990
West Indies, &c.	M.	+ 50	+202	− 10	+ 18	− 85	−123	−125	− 73
	F.	+ 61	+195	+ 35	− 114	−102	−136	−124	+ 73
	Total	+111	+397	+ 25	+ 162	−187	−259	−249	± 695
Total	M.	+ 67	+226	− 24	+ 211	− 40	−113	−136	+ 191
	F.	+ 91	+115	− 55	+ 74	−103	−142	−171	− 191
	Total	+158	+341	− 79	+ 285	−143	−255	−307	± 784

TABLE V.—*Civil condition, per* 1,000 *over* 15.

Country.	Males.			Females.		
	Married.	Single.	Widowed.	Married.	Single.	Widowed.
England and Wales	545	403	52	506	390	104
Scotland	484	462	54	452	440	108
Ireland	385	555	60	386	483	131
Malta	493	461	46	489	409	102
Cyprus	601	354	45	614	242	144
Australia	462	497	41	507	403	90
New Zealand	469	491	40	534	384	82
South Africa (whites)	501	471	28	590	334	76
South Rhodesia (whites)	374	595	31	666	272	62
India	710	203	87	685	39	276
Ceylon	534	412	54	602	222	176
Straits Settlements	437	563		658	342	
Johore (Malay)	329	671		684	316	
Siam States*	709	291		712	288	
Mauritius	203	764	33	223	674	103
South Africa (coloured)	501	476	23	576	284	140
Swaziland	539	461		795	205	
Gambia (colony)	288	712		383	617	
St. Helena	454	432	64	411	495	94
Jamaica	335	630	35	297	617	86
Barbados	468	493	39	304	598	98
Bermudas	444	500	56	413	458	129
Bahamas	565	390	45	469	413	118
Grenada	392	546	62	333	571	96
St. Vincent	359	609	32	265	636	99
Dominica	367	596	37	291	610	99
Santa Lucia	397	561	42	329	567	104
Trinidad	250	719	31	285	631	84
British Guiana†	370	590	40	386	509	105
British Honduras	388	555	57	411	449	140
All ages—						
Canada	624	351	25	575	371	54
Hong-Kong (Chinese)	332	646	22	190	680	130

* Kedah and Perlis only. † Above 10.

Discussion *on* Sir J. A. Baines's Paper.

Lord George Hamilton, in moving the vote of thanks to the reader of the Paper, said that at the end of his Paper Sir Athelstane had called attention to the astonishing variety of social conditions existing throughout the British Empire; but if these questions really were discussed they were rather more political than social, and more social than statistical. At the same time he thought it brought home to all of them, when they saw the very small number of white men who lived in the oversea Dominions of the Empire, in some sense the nature of the burden which they bore in the administration of the countries in which they lived. The figures which Sir Athelstane had skilfully grouped together naturally pointed to certain conclusions; and he thought he might say throughout the Paper, with very few exceptions, the conclusions were what one would anticipate. But he wished to call attention to one or two points which he thought were worthy of special notice. There was one statement which rather surprised him on page 390 in connection with the inter-change of population between Canada and the United States. Sir Athelstane remarked: "In regard to the exchange of population with the United States, "I can only say that the latter, as usual, gets the better of the bargain "as far as numbers are concerned, since 1,205,000, nearly half women, "are sent by Canada across the frontier." He was under the impression that during recent years the balance was the other way, and that the opening up of the territories in the west had caused a very considerable migration of subjects of the United States over the border. It might be that that migration had been taking place subsequent to the Census, but it was rather a surprise to him to hear that there was such a very large balance in favour of the United States as that mentioned by Sir Athelstane. There was one set of figures which specially interested him, namely, the relation of men to women. It would be noted on page 391 that the proportion of women in Wales and England to a thousand males was 1,068. In Scotland it was 1,062, and in Ireland it was only 1,003. He thought the general inference they drew from migration was, that the more the population of the country immigrated the greater was the disproportion between the women and the men, because the men went in much larger proportions as a rule than women. That was undoubtedly the case in this country, and he thought also in Scotland. In England—excluding Ireland—he thought there was a majority of women over men of something like 15,000. In Ireland immigration had been on a very much larger scale than in either Scotland or England. How it had come to pass, that notwithstanding this great immigration, this proportion had not been disturbed, he could explain in this way—that he thought a very large proportion of the female relatives of the Irish were not averse to entering domestic service, and there was a very great demand for domestic servants in the United States. He therefore assumed that the male immigrant carried his female folks with him when he immigrated. In England and Scotland, on the other hand, among certainly a considerable proportion of the class of immigrants there was a reluctance on the part of family relatives to entering into domestic service and they stayed at home. He did not know whether that was the explanation; but it was a curious fact that where immigration was on a very large scale the proportion of women to men had not been disturbed.

Sir EDWARD BRABROOK, in seconding the vote of thanks, said he was inclined to think that the untoward circumstance that the Executive Committee of the Society were now and then disappointed of a Paper they expected to have, was really one of those calamities which were blessings in disguise, because the Executive Committee usually resorted to Sir Athelstane, who produced a Paper full of learning and humour, and probably more interesting to the Fellows at large than the Paper they would have had if the original arrangemen had been carried into effect. On the present occasion, they had had a most interesting and suggestive Paper relating to an ambitious proposal, of obtaining, if possible, something like an approximately simultaneous Census of the whole of the British Empire. The lesson, he took it, to be derived from the Paper was, that even if an ambitious proposal of that kind could be carried into effect, much must not be expected from it until someone possessed of Sir Athelstane's encyclopædic knowledge had expounded the significance of the facts relating to so many diverse races in different social circumstances.

Sir JAMES WILSON said the most outstanding consideration which occurred to him was the enormous responsibility which rested upon them of the good government of such a very large proportion of the world's population. From the figures given on page 386 he understood there were 362 millions, which practically meant the total population of the British Empire outside the United Kingdom, and if he understood rightly it meant, of that population, less than 4 per cent. were white. That was including India and including the Dominions of Canada, Australia, South Africa and other places. That meant that practically the whole of that enormous population was dependent for its good government, not upon the white population altogether, but in the last resort upon the population of the United Kingdom. Even in the Dominions the Legislative and Executive authority exercised there derived its basis from the Legislation and the Executive Authority of their little Kingdom, and that was especially the case in India and the Crown Colonies, where every official, white or dark, who exercised authority derived it from the King in Parliament of the United Kingdom; and ultimately, one might say, to a very large extent, the burden of governing these races rested upon the electors of the United Kingdom, who sent Members to the House of Commons. He did not realize that only 2 millions of people in the British Empire were born in the United Kingdom. He would have thought that the number of people living in the Empire outside the United Kingdom was more than 2 millions. It was a considerable number, but it was less than he would have expected to find. He was rather surprised also to find that in proportion to the population of the country the natives of the United Kingdom bulked largely in New Zealand, and he understood that 21 per cent. of them were born in the United Kingdom. At one time New Zealand was one of the favourite places for people to go to from this country, but he would have thought that more recently emigration had been very much more general into Canada from this country than perhaps to Australia and to New Zealand. However, he supposed the figures were correct and that his impression was a false one. Sir Athelstane Baines had told them that the statistics regarding age were not to be depended upon, and one had plenty of experience in support of that suggestion. He remembered when he was checking the Census in India in an out-of-way district he was looking down the Census Tables and found a man in a very primitive village had entered himself as 100 years of age. He went to see the old gentleman, and he said to him, " How old are you ? " He said, " About 100." I said to him, " You do not look more than 70." He said, " Perhaps it is only 70." He then corrected the Table from 100 to 70 ; but whether it was correct or not one could not tell, and even in this country one could not depend on ages.

Dr. John Pollen said he had visited New Zealand and Australia and he knew something about India. He had, of course, noted the great ambition of the people of Australia to make their land exclusively a white man's country ; he had also noted the impossibility, in his opinion, of the realisation of that idea. It seemed to him perfectly impossible that the few millions of white men in that country could succeed in developing that great Continent as it ought to be developed. He had heard on all sides of the desirability of keeping out the man of dark complexion from the land, but he could not help realising how perfectly impossible it was for the white man to do under an Australian sun the work that there was to be done if that great Continent was to be developed. He shared in the appreciation expressed for the admirable Paper, and was grateful for being allowed to express that appreciation.

Dr. T. H. Stevenson referred first of all to the tendency of Irishmen to congregate around the age of 70. He thought it had been commented upon at various times, and they had noticed the fact with great interest when the Irish Report came out ; but on looking into the figures for the Irish Census of ten years ago they found there was a remarkable tendency to be 60. So that, apparently for some reason, there had been a wave of population around that age or at all events of persons who either thought they were that age or in whose interest it was to describe themselves ten years ago as 60 and now as 70. They found that, although it was not so marked ten years ago, it was now very marked indeed, so that possibly it was not so entirely connected with old-age pension considerations as one at first sight would be inclined to suppose it to be. He then referred to the inter-change of population between Canada and the United States, and he said he heard with no surprise that there should be more inhabitants of Canadian birth in the United States than inhabitants of the United States in Canada. It left out of consideration the fact, in the first place, that the emigration of French Canadians into the factory districts of the New England States had been going on for many years, and was a very considerable item in the immigration statistics of those States, whereas the movement from the Western United States into Canada was a comparatively recent one. Again, they were accustomed to seeing statistics of the flow into the Western areas of Canada from the Western United States, and they seldom saw any account of the return flow: but there was a considerable return flow. He saw the figures the other day, and speaking from memory he thought they amounted to from 30 to 40 per cent. of the in-flow. Therefore, taking into consideration the fact that the one was an old movement and the other was a new one, and that although the new movement was of very large extent or to a considerable extent offset by a return flow, no surprise need be felt that the figures which referred not only to the movement of the last few years but for the last fifty years or more, should come out as Sir Athelstane showed they did.

Mr. E. A. H. Jay said the impression he had got some years ago when going round Ireland with the Royal Commission on the Feeble-Minded was very similar to what came out in the Paper. He thought it was clearly the fact from what he then observed, that young families did emigrate largely from Ireland to the United States, and the consequence was they naturally got a very large proportion of older people remaining in the country, quite apart from any artificial or false statistics attributable to old-age pensions. He thought it also bore out what Lord George Hamilton had said about the proportion of the male sex, because in Ireland families emigrated, and not single men only. They remained out there for a considerable period, sending money home to support old people in the old country, and then returning in comparatively old age and settling again in Ireland for the remainder of their years. The impression one had seemed to be exactly what the figures bore out. He referred to another interesting point with regard to Barbados. Sir Athelstane mentioned in his Paper the export of expert white workers from Barbados. Some eighteen years ago he was out there, and he remembered at that time there was a population of a rather curious type, the descendants of convicts who were deported there in the time of Cromwell. It was quite a different population from the ordinary governing classes in a Colony and climate of that type. On one side of the island there was a considerable white population, and they were quite peculiar. It was a rather remarkable fact also that they did not get there the same mixture of the black and white race as in some other islands, notably Martinique. The white and black elements kept very much apart. One might suggest various causes. He thought the existence of the peculiar class of population he had mentioned might be some explanation of the point that was mentioned on page 388 of the Paper.

Mr. Coleman P. Hyman said that one of the interesting points concerned the possibility of Irish people imagining they were older than they were, with the prospect of pensions and that sort of thing. Talking one day with a prominent official in New South Wales, at the time the Old Age Pensions were introduced there, he was told they had had a remarkable number of applicants for pensions from natives of Ireland. With regard to one application in particular the forms had been sent in backed by authority which should have been convincing; but by reference to previous applications in other departments this, and others, were found to be quite at variance with the original particulars forwarded to the authorities, especially on the question of age. Dr. Pollen had referred to the possibility of Australia maintaining its present position in regard to immigration restriction. He was one of those who thought Australia would never be able to develop the Northern territory particularly, while it insisted on that policy, and it certainly would never be able to defend Australia against the incursion of, say, the Japanese, if, when the Anglo-Japanese Alliance was abrogated, the latter Power felt inclined to enter Australia. He thought the Paper was extremely valuable, as was the work of the Society in encouraging co-ordination of effort to secure at least comparative uniformity in the compilation of statistics which must be of extreme value, In Australia a few years ago each of the States in the Commonwealth had some different system of compilation. It was not nearly so much so to-day. When they came to consider that the population of the whole of Australasia, including New Zealand, was between two and three millions less than that of London alone, one could understand that the value of statistics compiled without uniformity was lessened. Australian Government statisticians now met before the Census was taken and arranged upon certain uniformity of work. One of the omissions of the last Commonwealth Census was, he considered, rather unfortunate. The "Religions of the People" were not noted. He thought that, particularly for students in future years, such statistics would be found to be very valuable. The reason for the comparatively large proportion of people from the United Kingdom in New Zealand was probably that New Zealand had attracted such a large number of Scotsmen. Dunedin was said to be another Edinburgh; and these emigrants were a good type.

The PRESIDENT asked whether Sir Athelstane Baines would a little soften the expression which he had applied to the method of sample—"statistically barren." In careful hands like those of Dr. Kiaer and Dr. Bowley that method promised to prove an effective implement of statistical research. It might even conceivably be employed to reduce the error due to falsification of returns such as that which had been mentioned in connection with the poll-tax. They had only to secure that the persons taken as samples were honest, always provided that the attribute under investigation was not correlated with honesty. Apropos of the particular falsification which had been mentioned, it might be interesting to recall that a poll-tax in England in the time of Richard the Second had produced an opposite kind of misrepresentation. The tax was imposed equally on males and females, and to evade it the number of females, as Professor Oman had pointed out, was greatly understated. Presumably in those early days girls were not so much in evidence as boys, and their existence was more easily concealed from the tax-collector.

Sir ATHELSTANE BAINES, in reply, said that he had been afraid lest the subject and his treatment of it might not lend itself to a good discussion; but he had been agreeably disappointed, and would do his best to reply to the interesting questions that had been raised. He began, of course, with the remarks of the President as to the value of "sampling." There was no intention on his part of underrating the statistical merits of this process in general, and he fully recognised its value in economic inquiry, such as into agricultural and pastoral resources. But there the field of variety was comparatively restricted, and far greater uniformity prevailed than in the case of social facts, where the variation was almost infinite. Here the samples would have to be so numerous and so widely scattered that they would approach, in fact, to the operations of a census. As to the interchange of population between Canada and the United States, the movement into the New England manufacturing districts of the latter had been in progress, he thought, for the last half-century or more. At first the Roman Catholic authorities had been adverse to permanent migration, but since their religion had spread there was a tendency to settle in the States, and one of the reasons why he had stated in the Paper that the States had got the better of the bargain was that they had secured almost as many women as men; whereas the influx from the States into the western provinces of Canada was chiefly that of men only. In regard to the low proportion of the excess of women in Ireland, the age-returns indicated a deficiency at the periods when girls would be most likely to seek service abroad. At these periods in England there was an excess, to some extent, which increased with the age. A committee of the Society was engaged in an inquiry into that subject, and he would only say that it was amongst the able-bodied widows chiefly that any demand by our Colonies might find a response. Sir Edward Brabrook had expressed a wish to see the census taken simultaneously throughout the Empire. This was hardly practicable in the geographical and other physical conditions of so wide-spread a domain. Nor was the difference of a month or so inimical to the general accuracy of the results as a whole. The unfavourable circumstances in which their countrymen spent their life in the smaller settlements had been put forward by him for the reasons well stated by Sir James Wilson. When he was referring to the larger British element in New Zealand than in Canada, he was speaking of the proportion to the total population, not in absolute figures. The latter were about 229,000 born in this country in the southern Dominion, and 784,000 in Canada. A speaker had mentioned with an approbation in which all would concur the number of Scotsmen in New Zealand. He had heard it said that the congregation of this race in Dunedin was due to the fact that there they enjoyed the same amount of fog which they would have in their native country. Into the question of a White Australia he was not going to enter further than to point out the difficulty of maintaining a racial frontier where geographical conformation was not specially favourable to it. He was glad to have the explanation of Mr. Hastings Jay of the character of much of the white population of Barbados and some other islands of the West Indies, as the figures had puzzled him. The number of aged Irish in Australia and the United States might be accounted for, perhaps, by the larger population of which they formed part at the time of the great emigration of the later forties. The point, however, to which Mr. Yule and he had been directing their attention was the source of the astonishing influx of the aged into Ireland since 1901; and this, he thought, it might not be unfair to attribute to the appreciation by a quick-witted people of benefits to be placed shortly within their reach.

The following Candidates were elected Fellows of the Society:—

C. W. Beak.
Arne Fischer.
F. H. Keeling.
J. N. Paterson.
A. B. Pilling.
H. L. Rietz.
T. W. Shackel.
G. A. Vaidya Raman.
W. F. S. Wilkinson.

ON THE USE OF ANALYTICAL GEOMETRY TO REPRESENT CERTAIN KINDS OF STATISTICS.

By Professor F. Y. EDGEWORTH, M.A., F.B.A.

(*Continuation.*)

SUBSECTION 2. MODERATELY ABNORMAL CURVES.

The central class which is next to be considered forms the most characteristic part of the present study. It consists of cases too far removed from the normal for the useful employment of the Generalised Law; cases which are not uncommon in concrete statistics, as shown by Professor Pearson and his followers. Let us begin by defining and as it were "pegging out" the area to which our operations will be confined.

Limitation of the problem.—The first of the conditions above laid down, that the constants should not be large, is twofold, relating to each of the constants (β and ϵ). Of the sub-conditions thus presented the latter is the more important, since the boundary which it prescribes proves to be *within* what we may call the first boundary. What the second boundary is may be seen by considering what the second fundamental equation becomes when the constant ϵ becomes very large, that is—according to our postulate*—approaches *unity*. The equation, which may in general be written—

$$(1 - \epsilon)\chi^2 + 2\chi(S - \epsilon R) + T = \epsilon R^2,$$

degrades, when ϵ becomes unity, to the comparatively simple equation $2\chi(S - R) = R^2 - T$. This curve intersects the abscissa in a point determined by the equation $R^2 - T = 0$; which proves to be satisfied by $\lambda = \cdot 58$ (nearly). When $S = R$, λ being zero, χ becomes infinite. The shape of the curve—in the region with which we are concerned—is roughly shown on Fig. 4 by the (partly thick and partly dotted) line E . . *e*. That the curve thus defined includes all the points on the *positive* side of the abscissa which concern us here may thus be demonstrated. Starting from (that member of the second family of curves which has) ϵ zero, let us suppose ϵ to be continually increased; and consider the horizontal distance of the curves thus presented from any assigned point on the ordinate, that is, the χ on the successive curves corresponding to any the same λ. Write $f(\chi, \lambda, \epsilon) = 0$ for the second equation—

$$\chi^2 + 2S\chi + T - \epsilon(\chi + R)^2 = 0.$$

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* *Ante*, p. 308.

We have to consider the differential coefficient—

$$\left(\frac{d\chi}{d\epsilon}\right)_{\lambda \text{ constant}}.$$

This differential coefficient $= -\left(\frac{df}{d\epsilon}\right)\Big/\left(\frac{df}{d\chi}\right)$.

Now $\left(\frac{df}{d\epsilon}\right)$, $= -(\chi + \mathrm{R})^2$, is always negative.

$$\left(\frac{df}{d\chi}\right) = 2\chi + 2\mathrm{S} - 2\epsilon(\chi + \mathrm{R}).$$

Or, restoring to R and S their values in terms of λ (given above),*

$$\left(\frac{df}{d\chi}\right) = 2\chi(1 - \epsilon) + 2(1 - \epsilon) + 2\lambda(9 - 3\epsilon) + 2\lambda^2\left(\frac{45}{2} - \epsilon\frac{15}{4}\right).$$

This expression is always positive, while ϵ is less than unity (λ being positive). Accordingly (within these limits) $\left(\frac{df}{d\epsilon}\right)$ is continually positive. At the same time it appears that to every assigned λ there is one and only one positive value of χ. For the value of χ corresponding to any λ is given by the equation—

$$\chi^2(1 - \epsilon) + 2\chi(\mathrm{S} - \epsilon\mathrm{R}) - (\epsilon\mathrm{R}^2 - \mathrm{T}) = 0,$$

and the first two terms of this equation are necessarily positive ($\epsilon < 1$, $\lambda > 0$); while the third term is negative, since T is greater than R^2—and *a fortiori* greater than $\epsilon\mathrm{R}^2$—up to the limit $\lambda = \cdot 6$ nearly, when $\epsilon = 1$. Thus the family of ϵ-curves covers the ground evenly, as we may say, throughout that portion of the quadrant which is marked off by the ϵ-curve for which ϵ is (just becoming) *unity*.

By parity of reasoning we may find, as the boundary fixed by the *first* sub-condition, the curve—

$$\chi^2(2\mathrm{Q} - 3\mathrm{R}) + \chi(\mathrm{Q}^2 - 3\mathrm{R}^2) - \mathrm{R}^3 = 0.$$

But it is unnecessary to exhibit or discuss this limit, as it lies *outside* the boundary which has been described. This appears from the following statement of the points on each curve corresponding to certain assigned values of λ. (With the mutual relations of the curves beyond the neighbourhood specified we are not concerned, as will presently appear)—

$\lambda =$	·2	·3	·4
χ_β	·64 . . .	·55 . . .	·54 . . .
χ_ϵ	·55 . . .	·37 . . .	·176 . . . ;

χ_β being the abscissa of the point on the limiting β-curve, and χ_ϵ the point on the limiting ϵ-curve, for an assigned value of λ the ordinate.

Corresponding, but more complicated, propositions may be deduced respecting the limits imposed by the first (*a*) condition in the lower quadrant (with negative values of λ). But it is unnecessary to pursue the investigation further, since almost the whole of the lower quadrant is ruled out by the second (b) condition to which we proceed.

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* *Ante*, p. 307.

The second condition also is two-fold; the first provision being that there should not be a discontinuity or break of the kind described above.* In order that this sub-condition should be fulfilled it is sufficient that the *denominator* should always be positive in the expression for the ordinate of the constructed curve, namely—

$$Y = \frac{\mathrm{f}(\xi)}{\frac{dX}{d\xi}};$$

where $X = a(\xi + \kappa\xi^2 + \lambda\xi^3)$, ξ is the inverse function of X, f denotes the normal error-function ($\kappa = \sqrt{\chi}$).† Now—

$$\frac{dX}{d\xi} = a'(1 + 2\kappa\xi + 3\lambda\xi^2);$$

and accordingly the condition is fulfilled if $3\lambda > \kappa^2 > \chi$.

This inequality is *sufficient*, but it is not *necessary* for the fulfilment of the condition in question. For it has been agreed that the condition is adequately fulfilled if it is not broken with respect to the sensible portions of the constructed curve.‡ Let us take, for instance, as the limit of safety the percentile corresponding to the point which is at the distance of *twice* the modulus from the centre of the generating curve, the percentile which cuts off at the extremity only some $2\frac{1}{2}$ per mille of the frequency group. Our condition then will be adequately fulfilled if the values of κ and λ are such that the expression $1 \pm 2\kappa\xi + 3\lambda\xi^2$ is positive for all values of ξ from 0 to 2. Since, when λ is positive (the more frequent case, I think), the last-written condition is of course fulfilled by all positive value of κ, we shall find it convenient to consider the expression as of the form $1 - 2\kappa\xi + 3\lambda\xi^2$ where κ now stands for $\sqrt{\chi}$ without its sign, in absolute quantity.§ This expression vanishes for $\xi = 2$ when $4\kappa = 21\lambda + 1$. Consider now the *line* which this equation denotes in the plane of κ and λ; a line intersecting the axis of λ at the point $\lambda = -\frac{1}{12}$, and making with the abscissa an angle of which the tangent is $\frac{1}{3}$. It may be shown that for all (the pairs of) values of κ and λ represented by this line, *up to a certain point on the line*, the expression

$$1 - 2\kappa\xi + 3\lambda\xi^2,$$

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* p. 309.

† *Congress Paper*, pp. 10, 13.

‡ *Ante*, p. 310.

§ The reader may be advised to mentally substitute for κ in the following paragraphs $|\kappa|$, meaning the absolute value of the constant, or $\sqrt{\chi}$ similarly understood; or to define the operator (now, if not *ab initio*) as

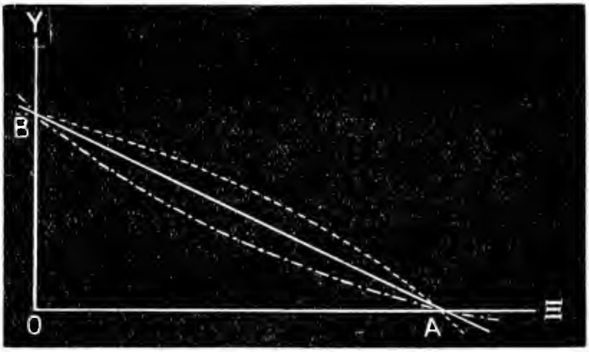
$$(a\xi - \kappa\xi^2 + \lambda\xi^3).$$

which we may call $\phi(\xi)$, or y, is positive, for all values of ξ from 0 to 2; and further that $\phi(\xi)$ is positive for the whole tract of values intercepted between the said line, the axis of λ and an ordinate passing through the said limiting point. To consider how the equation $\phi(\xi) = 0$ is affected by the change of the constants, let us replace κ by its assumed value in terms of λ; and we have for y $(= \phi(\xi))$,

$$3\lambda\xi^2 - \frac{1}{2}(12\lambda + 1)\xi + 1 = 0.$$

This equation has always (as it ought) one root equal to 2. In other words, the *curve* connecting the value of y, considered as an ordinate with the abscissa ξ in the plane of y and ξ, always passes through the point $\xi = 2$, $y = 0$. It always also passes through the point $\xi = 0$, $y = 1$. Thus, in Fig. 2 (where $OA = 2$, $OB = 1$)

FIG. 2.



the thick (straight) line represents what the curve becomes when $\lambda = 0$. The *dotted* line above the straight one, at points between A and B, represents the curve varied by changing λ from 0 to a small negative value, say $-\Delta\lambda$. The change to $+\Delta\lambda$ is represented by the *broken line* below the straight one between A and B. The rationale of these variations appears by observing that

$$\left(\frac{d\phi}{d\lambda}\right)_{\xi \text{ constant},} = 3\xi^2 - 6\xi;$$

and accordingly $\phi_{\xi \text{ constant}}$ is, for values of ξ between 0 and 2, *negative* for positive values of λ, and positive for negative values of λ; and conversely for values of ξ greater than 2. To observe how the *second* root of the equation $\phi(\xi) = 0$ (one root being always 2) is affected by the change of λ; let us first suppose that λ is continually diminished from $-\Delta\lambda$ to $-\frac{1}{12}$, the lowest values of λ with which we are concerned. The root in question will vary from $-\infty$ to -2. Accordingly the equation $\phi(\xi) = 0$ (having one root equal to 2) will have no roots between 0 and $+2$; our condition will be fulfilled. Next suppose λ to be continually increased from $+\Delta\lambda$.

The variable root of the equation will vary from $+\infty$ to $+2$. At that limit the condition breaks down. The limit evidently occurs at the value of λ at which the equation $\phi(\xi)=0$ has two equal roots each equal to 2. That is $\phi'(2)=0$ (as well as $\phi(2)=0$). Whence, substituting 2 for ξ in $\phi'(\xi)$, viz., $6\lambda\xi-\frac{1}{2}(12\lambda+1)$, we have $6\lambda=\frac{1}{2}$, $\lambda=\frac{1}{12}$.

Now suppose the *line* $12\lambda-4\kappa+1=0$, in the plane of κ, λ to be *pushed up* by adding to the right side a positive quantity, c. Then 2 is a root of the equation $3\lambda\xi^2-4\kappa\xi+1=c$. The new curve representing that equation in the plane of y and ξ passes through the point $\xi=0$, $y=2$; and, as may be shown by parity of reasoning, has no root between 0 and 2 for all the values of λ between $\lambda=-\frac{1}{15}$ and $\lambda=+\frac{1}{12}$. Nay, even for a larger value of λ, say $\frac{1}{12}+\Delta$, the equation $\phi(\xi)-c=0$ will have no root between 0 and 2 provided that c is sufficiently large with respect to Δ.

Now let us transfer these propositions to the plane of χ and λ. The *line* $\kappa=3\left(\lambda+\frac{1}{12}\right)$ is now to be replaced by the *parabola*

$$\chi=9\left(\lambda+\frac{1}{12}\right)^2,$$

represented by the curve aC in Fig. 3. For all points on this parabola from $\lambda=-\frac{1}{15}$ $(\chi=0)$ to $\lambda=+\frac{1}{12}\left(\chi=\frac{1}{4}\right)$, and for all points in the sort of column standing in this portion of the parabola as base, and bounded by the ordinates at $\chi=0$, $\chi=\frac{1}{4}$, the relation of χ and λ is such that the equation $\phi(\xi)=0$ has no roots between 0 and 2. That condition is also fulfilled by the greater part of the tract above the parabola beyond the ordinate at $\chi=\frac{1}{4}$. For the point $\chi=\frac{1}{4}$, $\lambda=\frac{1}{12}$ is defined by the condition that for those values of χ and λ the equation $\phi(\xi)=0$ should have equal roots. But that is precisely the limit at which the roots begin to be imaginary. In fact, the limiting parabola $\chi=9\left(\lambda+\frac{1}{12}\right)^2$ *hitches on*, so to speak, at the point specified to the *line* $\chi=3\lambda$; which, as we have already seen,* forms the limit at which the relation between χ and λ begins to be such as to satisfy condition b perfectly for all values of those variables. The effective limit above which all values of χ and λ fulfil the required condition adequately or perfectly is represented by the thick lines in Fig. 3, the mixtilinear boundary which is a parabola from A to C and a straight line from C to infinity.

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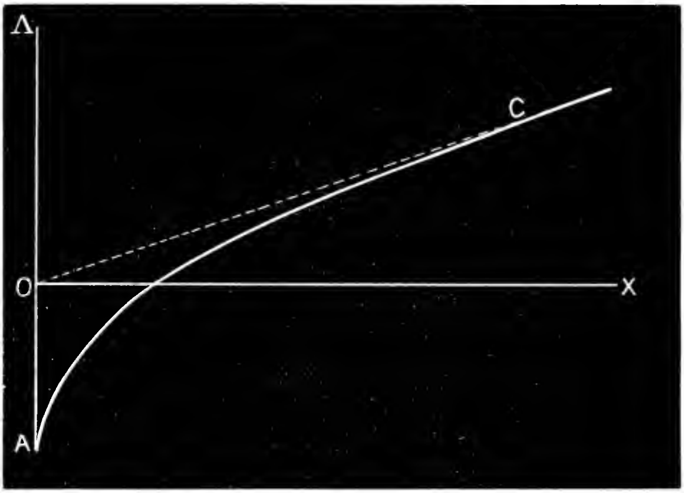
* See above, p. 417.

The propositions which have been proved, with respect to the convention that the expression $1 - 2\kappa\xi + 3\lambda\xi^2$ should continue positive for all values between 0 and 2 hold good, *mutatis mutandis*, for any neighbouring limit, *e.g.*, 1·5 or 2·5.* The limiting parabola, whether below or above the one represented in Fig. 3, viz., AC, will now touch and hitch on to the line O at a point C′ either beyond or short of C.

FIG. 3.



The preceding theorem is important, not only in itself, but also as affording a clue to the less simple investigation relating to the second clause of condition *b*, namely, that there should not occur a minimum ordinate, a turn-up of the constructed curve, between the median and some assigned limit. Let us again, for convenience of exposition, take + 2 as the limit; remarking that the choice of 2 as the limit, with respect to *this* provision involves the fulfilment of the former provision—the absence of a break—to a greater distance than 2. Let $\psi(\xi)$ stand for the numerator of the expression for the ordinate of the constructed curve. That is,

$$\psi(\xi) = 3\lambda\xi^3 - 2\kappa\xi^2 + (3\lambda + 1)\xi - \kappa = 0.$$

We have now to secure a relation between κ and λ, such that there is *only one* root for the equation $\psi(\xi) = 0$ between $\xi = 0$ and $\xi = 2$; the root corresponding to the *mode* of the constructed curve. Put $30\lambda - 9\kappa + 1 = 0$ (securing that the equation should have a root $= 2$); and, after the analogy of the previous investigation, consider the varying shape of the curve connecting z, the ordinate of $\psi(\xi)$, and ξ (in the planes of those variables) for successive values of λ from $-\frac{1}{15}$ upwards. There will be only root of the equation $\psi(\xi) = 0$ between 0 and 2 up to a certain value of λ, namely, that for which the equation $\psi = 0$ has two roots equal to 2. We have then $9\lambda\xi^2 - 4\kappa\xi + 3\lambda + 1 = 0$ when 2 is substituted for ξ. Also $30\lambda - 9\kappa + 2 = 0$. Solving the simultaneous equation, we have $\lambda = \cdot\dot{0}6\dot{3}$, $\kappa = \cdot\dot{4}3\dot{2}$.. Returning to the plane of χ and λ, we have for the limiting parabola $\chi = \frac{100}{9}\left(\lambda + \frac{1}{15}\right)^2$. represented by the curve AB in Fig. 4, up to the point B on that parabola for which $\lambda = \cdot\dot{0}6\dot{3}$, $\chi\ (= \kappa^2) = \cdot 187$ (nearly). At that point the limiting parabola hitches on to another curve (not shown in the figure), the curve which defines the relation between the coefficients of the cubic equation $\psi(\xi) = 0$, such that the roots just begin to be imaginary.

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* Within a certain range of values, as to which see sub-section 3.

It is well known that two roots of a cubic equation are or are not imaginary, according as a certain function of the constants, which may be put in the form $G^2 + 4H^3$, is or is not greater than zero.* In the case before us—

$$G = \kappa\left(2\lambda - 3\lambda^2 - \frac{16}{27}\kappa^2\right)$$

$$H = \lambda(1 + 3\lambda) - \frac{4}{9}\kappa^2.$$

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* There is in this neighbourhood a pitfall which was not avoided in my former paper. If we form the expression for the criterion $G^2 + 4H^3$ in terms of the coefficients of the cubic equation, which gives the positions (in terms of the modulus) of the points in the original curve which correspond to critical points, maximum or minimum ordinates, for the constructed curve—that is, the equation

$$3\lambda\xi^3 - 2\kappa\xi^2 + (1 + 3\lambda)\,\xi - \kappa = 0\,;$$

it appears that the criterion vanishes when $\lambda = 0$. But this circumstance has not the significance which I attributed to it in the *Congress Paper* (p. 13). The axis of χ does *not* form the watershed between possible and impossible roots of the equation (and accordingly between limited and unlimited frequency-curves): as will be shown in the sequel. The deceptive appearance disappears if we consider two small finite values of λ on either side of the passage through zero, say $+\Delta\lambda$ and $-\Delta\lambda$. The corresponding equations (for the positions of maximum or minimum) are—

$$3\Delta\lambda\xi^3 - 2\kappa\xi^2 + (1 + 3\Delta\lambda)\xi - \kappa = 0\,;$$

$$3\Delta\lambda\xi^3 + 2\kappa\xi^2 - (1 - 3\Delta\lambda)\xi + \kappa = 0.$$

In neither case does the criterion in general vanish. Both equations have two roots, nearly equal to the roots of the quadratic

$$2\kappa\xi^2 - \xi - \kappa = 0,$$

which roots are real, provided that $\kappa^2\ (= \chi) < \frac{1}{8}$. At that limit (as will be noticed in the following subsection) two roots of the cubic become equal; the mode becomes coincident with the minimum at the boundary of the constructed curve, and the resemblance to the shape of the normal curve becomes more imperfect.

§ Cp. *Theory of Equations*, by Burnside and Panton, Arts. 35 and 43.

If we substitute these equivalents of G and H in the above written expression for the criterion which may be called K, we shall find that K vanishes when the co-ordinates χ and λ are respectively $\frac{48}{111}$ and $\frac{7}{111}$—these being the values which, as above shown, cause the equation $\psi(\xi) = 0$ to have two roots equal to 2. From the point in the plane of χ and λ assigned by these values, as we move to the right we find that the curve $K = 0$ lies *above* the limiting parabola, every point of which between B and C represents values of χ and λ, which cause the equation $\psi(\xi) = 0$ to have two real roots less than 2 (render one equal to 2). At the point C the curve $K = 0$ again intersects the parabola ABC, since at that point the value of χ and λ are again such as to cause the equation $\psi = 0$ to have two equal roots; this time the two roots less than 2 (one root being still equal to 2). At this point the curve $K = 0$ crosses the limiting line. Some assistance in finding the position of the criterion curve may be obtained by observing that it always lies *outside* the simpler curve $H = 0$ (not shown in the figure). The equation of this curve is $\chi = \frac{9}{4}(3\lambda^2 + \lambda)$; the equation of a parabola which has its apse at the point $\chi = -\frac{3}{16}$, $\lambda = -\frac{1}{6}$, passes through the origin, and cuts the limiting line at the point $\chi = \frac{1}{3}$, $\lambda = \frac{1}{9}$. We are not now concerned to follow the criterion curve K, nor the ancillary curve H, across the limiting line. They might lead us into regions of nonentity and insignificance. For though within the barrier K, and *a fortiori* within the barrier H, there is fulfilled one clause of condition *b*, namely, that the ordinate of the constructed curve should have only one critical point; still, as the other clause, that there should be no discontinuity, is not fulfilled, the construction breaks down as soon as we have crossed the line OC. That limiting line becomes the boundary of our territory on to the point at which it intersects the limiting ϵ-curve already described. That intersection takes place at a point for which the ordinate λ is a little less than $\cdot 2$, and the co-ordinate χ a little less than $\cdot 6$. The point may be more exactly determined by the solution of the biquadratic equation which results from putting $\chi = 3\lambda$ in the expression given on an earlier page* for χ_ϵ the abscissa of a point on the limiting ϵ-curve. But probably the following statement is sufficiently accurate for the present purpose:—

When $\lambda = \cdot 1$, $3\lambda = \cdot 3$, $\chi_\epsilon = 1\cdot 05$.
When $\lambda = \cdot 2$, $3\lambda = \cdot 6$, $\chi_\epsilon = \cdot 55$ . . .

From the intersection of the limiting line with the limiting ϵ-curve the boundary consists of that curve, on to the point at which it intersects with the axis of λ, a point which, as already observed, is distant nearly $\cdot 6$ from the origin (see Fig. 4).

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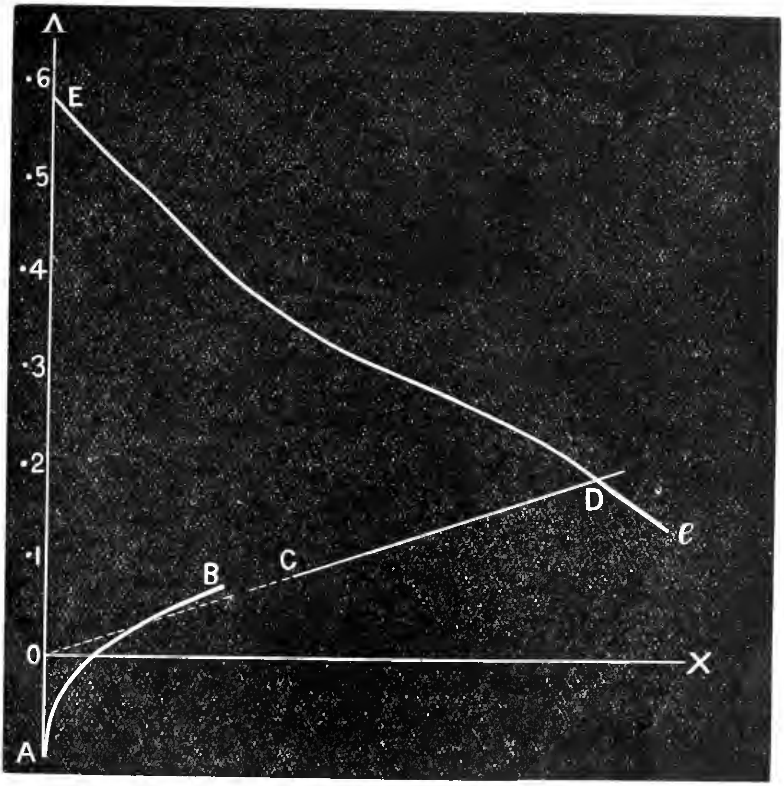
* P. 415.

FIG. 4.



Thus the area to which our operations are restricted is defined by the mixtilinear boundary, which consists of a parabola from A to B (Fig. 4), a curve of a high dimension (not drawn in the figure)* from B to C, a straight line from C to D, a curve of the fourth dimension from D to E, and the line EA, which is part of the axis of λ. Within these narrow limits, according to the hypothesis on which our formula is based, the search for the coefficients to be inserted in the formula is confined. In so far as coefficients adapted to concrete data cannot be found within these limits the hypothesis will be discredited.

Approximate solutions.—The field which has been demarcated is now to be searched for roots to the proposed equations. We may begin with the simple case in which the first constant β is, or may be, treated as zero. The analysis above given† suggests the proper treatment of this case. We have seen that the successive curves of the ϵ family cut the axis of λ at points higher according as ϵ is further on the positive side from zero. The proposition is readily extended to the negative values of ϵ and λ, with which alone we are now concerned, that is, as far as $\lambda = -\frac{1}{15}$, or thereabouts.* Up to that limit at least the smaller ϵ is with its negative sign (that is, the larger in absolute quantity), the greater will be the distance of λ from the origin, on the negative side. This relation between λ and ϵ is more exactly expressed by the equation $T = R$ (the terms affected with χ, in the fundamental equation κ, having by hypothesis now disappeared). Explicitly we may write the equation—

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* The criterion curve will be traced and discussed in the following sub-section.

† P. 421.

$$\lambda^4\left(\frac{405}{8} - \epsilon\frac{225}{16}\right) + \lambda\left(\frac{135}{4} - \epsilon\frac{45}{2}\right) + \lambda^2\left(9 - \epsilon\frac{33}{2}\right) + \lambda(1 - 6\epsilon) - \epsilon = 0.$$

On this equation it may be observed: (1) when ϵ is negative there is no positive root of the equation; when ϵ is zero the root (which we require) is zero; when ϵ is positive, but less than unity, the first two terms of the equation are always positive; and of the remaining terms the last only, or the last two only, or all three are negative according as ϵ is (greater than zero but) less than $\frac{1}{6}$, greater than $\frac{1}{6}$, but less than $\frac{6}{11}\left(\frac{18}{33}\right)$, or greater than $\frac{6}{11}$ (but less than unity). It thus appears that there is at most only one positive root to the equation.

TABLE II.—*Evaluation of* λ *when* β *is very small.*

β (β_1)	ϵ (η)	λ	Authority and reference.
0 (*·0056*)	·03 (*·366*)	·0277	Maynard (*Shirley Poppies*), *Biom.*, vol. VII, p. 229.
0 (*·0002*)	− ·033 (− *·4*)	....	Miss Fawcett (*Statures*), *Biom.*, IV, p. 442.
	− ·035	− ·039	Fictitious typical example.
0 (*·00237*)	− ·0377 (− *·4517*)		Elderton (*Assurances*), *Frequency-curves*, p. 62.
0 (*·00536*)	·048 (*·1699*)	....	Elderton (*Sickness*), *loc. cit.*, p. 70.
0 (*·008*)	·054 (*·65*)	....	Pearson (*Skull-index*), Contributions II, Ex. 5.

Table II presents some concrete examples which may be referred to this head. Thus, in the first example, taking ϵ as + ·03, I find for the biquadratic equation determining λ—

$$\lambda^4\frac{3213}{64} + \lambda^3 33\cdot075 + \lambda^2 8\cdot505 + \lambda\cdot82 - \cdot03 = 0.$$

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* Above, p. 421.

Making the coefficient of the first term unity, and applying Horner's method I find for λ ·0277.

This result might have been found by the approximative formula, derived from the equation connecting ε and λ, for λ in ascending powers of ε, viz.—

$$\lambda = \epsilon - 3\epsilon^2 + \frac{75}{4}\epsilon^3 \; . \; . \; . \; .$$

Putting ·03 for ε in this formula we have λ nearly as before = ·0278.

I have *begun* with the approximative formula in the case of a typical example for which the constant ε is negative, viz., — ·035 (intermediate — ·033 and — ·037 occurring in the table). Substituting — ·035 for ε in the approximative formula I obtain for λ, — ·0387; which satisfies well enough the more accurate biquadratic—

$$\lambda^4 51{\cdot}117 + \lambda^3 34{\cdot}5375 + \lambda^2 9{\cdot}5775 + \lambda\, 1{\cdot}21 + {\cdot}035 = 0.$$

One or both of these methods can evidently be applied with ease to the other examples given in the table.

Attention may be called to the magnitude of the coefficient of ϵ^3 in the approximative formula for λ—that coefficient which may be described as (the sixth part of) the *third* differential coefficient of λ with respect to ε. The magnitude of the differential coefficients in the expansion of λ just now given, and in the more general expansions of χ and λ given in our first subsection, demand caution in the use of approximative formulæ. Thus, in dealing with an example in which ε = say ·13, it would not do to put $\lambda = -\epsilon\,\frac{1}{3}\,\epsilon^2 + 18{\cdot}75\,\epsilon^3$; since the third term, about +·04 is nearly equal in absolute magnitude to the second term, about ·05.

It should be noticed that the tangents to the ε-curves at successive points on the axis slope downwards with a slope which diminishes (in absolute magnitude, approaching more nearly to the horizontal) as we ascend the axis. For, in general, the tangent of an ε-curve at any point of which the co-ordinates are χ and λ, $\frac{d\lambda}{d\chi}$,

$$= -\left(\frac{d\,\Psi}{d\,\chi}\right)\Big/\left(\frac{d\,\Psi}{d\lambda}\right) \quad ;$$

where Ψ is that function of χ and λ to which ε is equated by the fundamental equation II. When χ is zero this expression reduces to

$$-2\,\frac{\mathrm{RS} - \mathrm{T}}{\mathrm{T'R} - 2\,\mathrm{R'T}}$$

Where R′, T′ denote the differential coefficients of R and T with respect to λ. When λ also is zero the expression for the tangent reduces to — 2. The tangent becomes — 2(1 — 4λ) for small values of λ.

The axis of λ, intersected by ε-curves of gradually varying slope and so arranged that the greater the (positive) distance of the intersection from the origin, the larger is the coefficient ε and so the further out lies the corresponding curve—the axis of λ in this respect may be regarded as typical of a class to which it may be referred (as a limiting case), the family of β curves. Let us pass from the limiting case in which β is actually becoming zero to the adjacent case in which β, though not indefinitely, is still very small, say δ, a quantity of which the second and higher powers may be neglected. Then the fundamental equation I degrades to $XQ^2 = \delta R^3$. If we inquire for what value of λ, χ is a minimum, the curve approaching nearest to the axis of λ, the answer is found by equating to zero $\frac{d\chi}{d\lambda}$

$$i.e.,\ \delta R^2\left(3Q\frac{dR}{d\lambda} - 2R\frac{dQ}{d\lambda}\right)\Big/Q^3.$$

Since Q is positive for all values of λ (the product of the extreme coefficients, 1·5 and $\frac{135}{8}$, being greater than the square of half the coefficient of λ, namely 9) in order to determine λ we should equate to zero the expression within brackets in the above written equivalent of $\frac{d\chi}{d\lambda}$. Assigning to Q and R their values in term of λ we obtain for the required value of λ the cubic equation—

$$\lambda^3 + \frac{2}{3}\lambda^2 - \frac{4}{75}\lambda - \frac{8}{225} = 0.$$

The positive root of this equation is in the neighbourhood of ·231, the negative roots—far below $\lambda = -\frac{1}{15}$—do not now concern us. There is no other minimum value of χ in the tract with which we are concerned.

Similar statements are true of the proximate β curve. But as we increase β, the turning point at which $\frac{d\chi}{d\lambda}$ becomes zero lies at a greater distance from the axis of χ. This appears by considering the trend of the locus of that turning-point, in the neighbourhood of the limiting point just now determined by $\chi = 0$, $\lambda =$ ·231. The locus is found* by equating to zero $\left(\frac{d\Phi}{d\lambda}\right)$: where Φ is the function of χ and λ to which β is equated by the fundamental equation I.

As we assign higher and higher values to the constant β we obtain a series of curve-lines sloping gradually downwards from a height at least equal to ·231, each outside the other, and none curling round so as to make the tangent $\frac{d\lambda}{d\chi} = 0$. To verify the last proposition, it may be recalled that to each positive value of λ there corresponds one, and only one, value of χ.

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* The equation of this locus is given explicitly in the following subsection.

Each of these descending β-curves, crossed by successive ϵ-curves, might be compared to a rope-ladder with rungs sticking out on both sides of the rope. The rungs of the ladder are sloping, the slopes being not quite parallel. The rope is supposed perfectly fixed, while slightly convex (downwards).

We thus obtain a simple rule for locating the values of χ and λ corresponding to any given values of β and ϵ. Having constructed beforehand once for all several ladders of the kind described, select the ladder which most nearly corresponds to the given value of β. Getting on to the ladder at some suitable point, say, on the axis of χ, where $\lambda = 0$, observe the value of ϵ pertaining to that point, say ϵ_0. According as ϵ_0 is less or greater than the given ϵ, ascend or descend the ladder till you come to a pair of rungs which contain between them the given value of ϵ. That is the required neighbourhood.

The process is illustrated by Fig. 5, A and B, taken in connection with Table III.

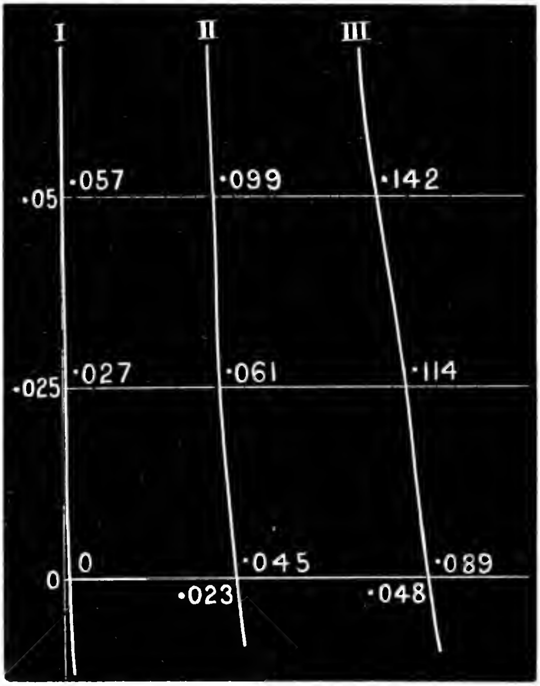
TABLE III.—*Location of roots in cases of moderate-sized constants.*

(To accompany Fig. 5.)

Designation.	β (β_1)	ϵ (η)	Location.	Description and reference.
a	·012 (*·0980*)	·067 (*·7994*)	I. r. 2—	Greenwood (*Phagocytes*), *Biom.*, VII, p. 517, Ex. 2.
b	·03 (*·2462*)	·09 (*1·082*)	I. r. 2—	Pearl (*Brainweights*), *Biom.*, IV, p. 38, Table VIII, Ex. 9.
c	·038 (*·3004*)	·011 (*1·35*)	II. l. 0—(—1)	Greenwood (*Phagocytes*), *Biom.*, VII, Table V.
d	039 (*·3123*)	·079 (*·9472*)	II. l. 1 ?	Pearson (*Opsonic Index*), *Biom.*, VII, p. 533.
e	·045 (*·3654*)	·06 (*·7138*)	II. l. 0—1	Greenwood (*Phagocytes*), *Biom.*, VII, p. 521.
f	·062 (*·4950*)	·083 (*·996*)	II. r. 0—1	Elderton (*Mortality*), *Frequency-Curves*, p. 79.
g	·064 (*·4837*)	·09 (*1·1022*)	II. r. 1—2	Pearson (*Opsonic Index*), *Biom.*, VII, p. 536.
h	·087 (*·7099*)	·116 (*·13914*)	III. l. 1—2	Greenwood (*Phagocytes*), *Biom.*, VII, p. 521.
i	·087 (*·6952*)	·158 (*·18965*)	III. l. 2—	Greenwood, *loc. cit.*
k	·088 (*·7060*)	·109 (*1·3088*)	III. l. 0—1	Pearson (*Opsonic Index*), *Biom.*, VII, p. 539.

The Roman numerals refer to β-curves; the Arabic numerals to values of λ, *e.g.*, 1—2 means between $\lambda <$ ·1 and $\lambda >$ ·2.

FIG. 5 A.



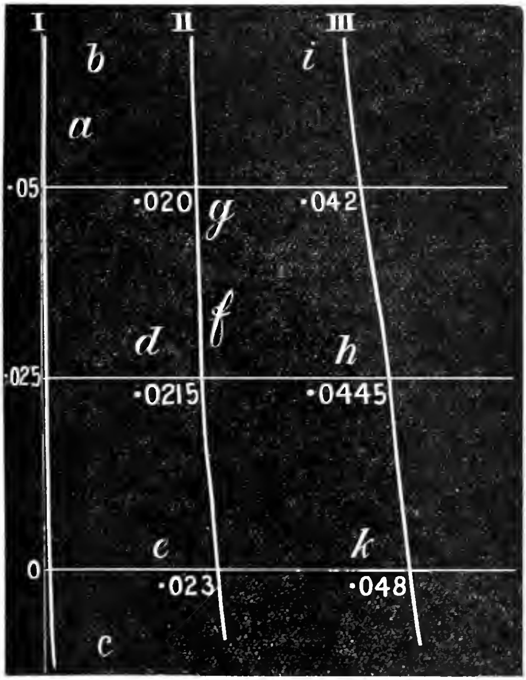
The figures underneath the horizontal line through 0 denote values of χ; the figures to the left of the perpendicular through 0 denote values of λ.

The other figures denote the value of ϵ pertaining to the curve passing through the corresponding point.

The Roman numerals I, II, III denote curves with the constant $\beta = 0$, 0·5, and ·1 respectively.

Thus the curve for which $\beta =$ ·05 and $\lambda = 0$ has for ϵ ·045; the curve for which $\beta =$ ·05 and $\lambda =$ ·025 has for ϵ ·061.

FIG. 5 B.



The numerals on the left of the axis of ordinates denote values of λ; the other numerals values of χ. The letters represent roughly the position of the roots pertaining to cases described in Table III.

Three of these ropes, each with two or three rungs (not shown in the figure, left to the imagination of the reader), are exhibited in Fig. 5A. Fig. 5B shows the application of the scheme to locate the values of χ and λ corresponding to several concrete examples. Table III gives references to the concrete examples and a key to the process of location. This key—the content of the penultimate column—is thus to be interpreted. The Roman numerals I, II, III designate respectively the axis of λ (considered as a member of the β family), the two subsequent β-curves drawn in Fig. 5, for which the values of β are respectively ·05 and 1. The Arabic numerals 0, 1, 2 designate rungs; the space between two rungs (in the neighbourhood of a point in the ladder), such as 1 and 2, being represented as "1—2." The space intercepted between two successive rungs is divided by the β-curve to which the rungs pertain into two tracts described as "right" and "left."

Thus in the instance designated in Table III as *d*, β is ·039: and accordingly the β-curve pertaining to the case lies to the *left* of the curve II, for which β = ·05. The value of ϵ at the point where the β-curve meets the axis is seen by Fig. 5A to be *less* than ·045.

But the given value of ϵ is ·079. Therefore the required point lies higher up, above the *rung* (not shown in the figure), which, sloping downwards from left to right, passes through the point for which ϵ is ·061. Thus the required point is in the neighbourhood designated *d*.

TABLE IV.—*Location of roots when the constants are considerable.*

β (β_1)	ϵ (η)	χ_0	ϵ_0	Minimum λ	Approximate. λ	Authority and reference.
·15 (*1·2019*)	·194 (*2·3331*)	·068	·123	·0113	> ·05	Greenwood (*Phagocytes*), *Biom.*, vol. VI, p. 386, Table IV, Type V.
·158 (*1·2664*)	·22 (*2·6386*)	·07	·13	·0127	> ·05	,, ,,
·242 (*1·9396*)	·324 (*3·887*)	1·32	·22	·027	·1	Pearson (*Ages of Bride*), Contribution XI, *Phil. Trans.*, 1901.
·52 (*4·168*)	·78 (*9·376*)	·388	·48	$\cdot 0\dot{6}$	·2	Pearson (*Lips of Medusa*).
·925 (*7·4*)	·9988 (*12*)	—	—	$\cdot 18\dot{3}$	·2	Fictitious example.

The treatment of the curves specified in Table IV differs in no essential respect from that which is illustrated in Table III, but only in that I have taken less trouble about the latter determinations. Accordingly, as some guarantee of their validity I have added statements showing that the assigned value of λ is above the inferior limit prescribed in each case by theory. Thus in the third example from the given value of β I find for χ_0, the abscissa of the point at which the β-curve cuts the axis of χ, 1·32. Whence ϵ_0, the ϵ-constant at point, is found to be ·22. As this is *less* than the given value of ϵ, it is proper to *ascend* the (or a neighbouring) β curve till we come into the neighbourhood of $\epsilon = \cdot 324$. I find that an approximation to this value of ϵ is presented by the point on the β curve for which $\lambda = \cdot 1$; and χ approximately ·08. But if $\chi = \cdot 08$, the smallest value that λ can have consistent with the fulfilment of condition *b* is ·03. But, in fact, the assigned approximative value of λ is ·1; so that it is well within the limit of safety. The last example is inserted to illustrate the wide range of cases to which the method is applicable. It need hardly be pointed out that the data $\beta = \cdot 916$, $\epsilon = \cdot 9988$ ($\beta_1 > 7$, $\eta = 12$) are of a magnitude very unusual in ordinary practice. The example was constructed by taking round numbers for χ and λ, in the neighbourhood of that corner in the boundary of our little territory which is indicated by the point D in Fig. 4. The round numbers were ·55 and ·2 respectively, not exactly the values of χ and λ at the said limit.

It will be understood that I am not pretending to propound *the* method of approximating to the roots of the equations. The process described is *a* method of lighting upon the neighbourhood of the required pair of values. The analysis on which the process is based shows that, when the neighbourhood has been located, it must be possible by a formal mechanical procedure to approximate more and more closely to the required roots. This follows from the character of the curves (within our province); the successive members of each family lying one outside the other; together forming a reticulation which may be made as fine as we please. There need be no fear—within the shelter of the barrier which we have traced—of imaginary values, multiple points, infinite ordinate and discontinuous curve. The path of the practitioner is smooth; the only difficulty, other than arithmetical, which can occur is occasioned by the circumstance that for certain values of the constants β and ϵ there may be equal roots—two identical values of λ. But the difficulty is not very great, and it is very unlikely to occur.* In general, there can be no doubt but that when we have lit upon an (adequately) approximate solution it is easy to proceed to a closer approximation. Thus, in the third example of Table IV, it having been ascertained that χ and λ are respectively nearly ·1 and ·1, substitute $\cdot 1 + \delta\chi$ for χ, and $\cdot 1 + \delta\lambda$ for λ in the proposed equations—

$$\text{I.}\quad \chi(\chi + \text{Q})^2 - \cdot 242\,\text{R}^3 = 0\,;$$
$$\text{II.}\quad \chi^2 + 2\text{S}\chi + \text{T} - \cdot 324\,\text{R}^2 = 0$$

(where Q, R, S, T denote the same functions of λ as heretofore), and form the equations for $\delta\chi$ and $\lambda\chi$. Neglecting higher powers of $\delta\chi$ and $\delta\lambda$, I find for the resulting equations—

$$\text{I.}\quad - \cdot 0062 + 6 \cdot 156\delta\chi + \cdot 919\delta\lambda = 0.$$
$$\text{II.}\quad - \cdot 0057 + 3 \cdot 518\delta\chi + 3 \cdot 222\delta\lambda = 0.$$

Solving these linear equations, I find for $\delta\chi$, ·0009; and for $\delta\lambda$, ·0008. The way is open, by putting—

$$\delta\chi = \cdot 0009 + \delta_2\chi, \text{ and } \delta\lambda = \cdot 0008 + \delta_2\lambda,$$

to obtain a second approximation. No doubt a further approximation would often be required more than happens in the example taken. I leave it to those who are better versed in the arts of approximation to say what application of Taylor's principle, what analogue of Horner's procedure, is most appropriate to two simultaneous rational algebraic equations of the higher dimensions, such as those with which we have to deal. Methods of interpolation and difference may, of course, be employed where we have obtained a series of values for β and ϵ, corresponding to a series of equicrescent values of χ and λ (*e.g.*, . . ·08, ·09, ·1, ·11, ·12 . . .). The practicability of the procedure is guaranteed by the previous analysis.

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* The difficulty occurs in the neighbourhood of what has been called the turning-point of the β-curve, the point at which $\frac{d\lambda}{d\chi}$ for any assigned value of β becomes infinite. The locus of this point is a curve which starts from the point on the axis of λ for which the ordinate is ·231: and the curve bends upwards to the right. The tract of simultaneous values for χ and λ, which is thus defined, corresponds to values of ϵ which are unusually large. Thus, for the initial point ($\chi = 0$, $\lambda = \cdot 231$), the corresponding value of ϵ is about ·3 ($\eta = 3 \cdot 6$); and the subsequent values are still larger. Moreover, the tract is small. For the curve in question, trending upwards, must soon meet the limiting ϵ-curve (with $\epsilon = 1$) which bounds our province.

Faced with the successes of the method of translation, the adherents of received methods will probably be minded like the sceptic of old, who was not impressed by the votive tablets of those who had been saved from drowning. Are there no failures, it will be asked; no cases which defy translation? And it is not to be denied that such cases occur. They will be considered in the next subsection.

(*To be continued.*)

THE RATE OF INTEREST ON BRITISH AND FOREIGN INVESTMENTS.

By R. A. LEHFELDT.

THE following Table continues the information given already[1] as to issues on the London market.

The total amount invested in 1913 was about equal to the average of recent years, and about two-thirds of it was in the form of issues that, in the present classification, are described as large, *i.e.*, those exceeding £900,000 in cash value.

Large issues, 1913. (*Bonds of less than seven years' currency excluded.*)

[Amounts in 1,000*l.*]

	Number.	Amount.	Rate.
At fixed interest—			
Home	5	4,970	5·23
Colonial	30	54,273	4·44
Foreign	25	57,455	5·45
Total	60	116,698	4·98
Shares—			
Home	5	6,705	—
Colonial	2	1,900	—
Foreign	2	4,073	—
Total	9	12,678	—
Grand Total	69	129,376	—

Redemption value included in interest.

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[1] *Journal*, January and March, 1913.

The average rate of interest was 4·98 per cent. At first sight this does not seem to indicate a rise during the year, but that illustrates the difficulty of stating a proper average. There was a rise in home issues of 0·22 per cent., in colonial of 0·14, in foreign of 0·20, and yet a rise in the weighted mean of 0·01 per cent. only—a negligible amount. The reason is that colonial issues last year were practically equal to foreign in amount, whereas in 1912 they were only half as great: the increase in weight of the lowest-interest class thus compensated for the general rise. Such a phenomenon is presumably accidental and temporary, so that if the present tendency to rise in interest should continue, the rise will soon show itself again in the mean. The numbers for the last five years are:—

1909	4·43 per cent.	1912	4·97 per cent.
'10	4·49 „	'13	4·98 „
'11	4·60 „		

A steady rise is also seen in the case of smaller issues.

Home issues were mostly industrial, so that the rate exceeded that on colonial issues, which are made, largely, on the part of governments and municipalities. Home issues are still small in amount, although the great prosperity of business has led to some diversion of capital into home trading enterprises.

Issues in 1902.

In the note published March, 1913, the investments made in 1901 were discussed side by side with those of ten years later. It is now possible to give the result of ten years history of investments made in 1902. The "large" issues of that year were:—

	Number.	Amount.	Rate promised.	Rate yielded.
At fixed interest—				
Home	15	54,040	3·12	3·07
Colonial	12	20,597	3·21	3·21
Foreign....	8	20,974	4·94	4·71
Total....	35	95,611	3·54	3·47
Shares—				
Home	1	1,060	—	3·32
Colonial	1	1,250	—	1·90
Foreign....	0	0	—	—
Total....	2	2,310	—	—
Grand Total	37	97,921	—	—

Nearly a third of the total is accounted for by an issue of consols, but apart from that there was a good amount of investment in home securities; in fact, the money was nearly equally divided between the three classes.

There have been two failures to pay the interest promised: one home and one foreign. The "United Collieries" (England) failed in 1904 to pay interest on its 5 per cent. debentures, and has since made a composition, and apparently is still trying to recover its position. The creditors have lost about half their due for the ten years. The Dunderland Iron Ore Company (Norway) has paid an average of about one quarter of the interest due on its 6 per cent. preference shares. The result of these failures is to reduce the investor's return in the way shown in the Table; it will be seen that the total loss amounts to but one-fiftieth part of the interest promised —so great is the security of modern loans.

The share issues consisted of one by an English railway and one by a colonial undertaking called the "Charter Trust." The latter was unsuccessful, and had to be reconstructed, but is now paying dividends which represent nearly 3 per cent. on the original capital, so that the loss is small. It is, of course, impossible to draw statistical conclusions from these two instances.

Medium issues.

The foregoing relates to single issues of securities exceeding £900,000 in cash value each. This limit was chosen in classifying the issues on the London market into "large," "medium" and "small." The second group is taken to extend from the above limit down to £200,000. The group is, of course, much more numerous than the first, and so involves a great deal of statistical work; but it does not include so large a mass of capital. It is instructive to compare the rates of interest offered in the two classes. A compilation of medium issues for the last three years has been completed, and it gives the results shown in the table on page 435.

It will be seen that a considerable stream of capital in this form flows into home industries, in fact a good deal more than in the form of "large" issues. But even in this case, the amount is quite eclipsed by the colonial and foreign investments—of which two groups the latter is somewhat the larger. Again, the preference for loans, as compared with shares, which is so marked a feature of the "large" investments, is reproduced in the "medium," though not quite so intensely—share issues constitute about one-eighth of the large, one-fourth of the medium class. It is to be expected that investment in the shares of companies located in the British Isles should take place more freely than in colonial and foreign ones, as the investor has less chance of control over the latter; and accordingly we find that the fraction of the money spent on shares rises to one-third in the case of "medium" home investments.

The home investments are all industrial, whereas the colonial are to a small extent loans by governments and municipalities; hence the colonies are able to secure the lowest rate of interest. But the difference between the rates charged to British and foreign borrowers is moderate (about one-third per cent.), and may be taken as a true measure of the difference in security.

The average interest paid on "medium" loans exceeds that on large by half to three-quarter per cent. This represents some difference in security between the two, but probably to at least as large an extent, a difference in marketability.

Number and amount of investments in the form of issues between 200,000*l.* *and* 900,000*l.*

['000's omitted.]

Date.	Fixed interest.						Shares.						Total fixed interest.		Total shares.		Grand total.	
	Home.		Colonial.		Foreign.		Home.		Colonial.		Foreign.							
	No.	£	No.	£	No.	£	No.	£	No.	£	No.	£	No.	£	No.	£	No.	£
1911 ...	26,	7,853,	36,	15,926,	37,	18,440,	6,	1,737,	18,	7,838,	17,	6,285,	99,	42,219,	41,	15,860,	140,	58,079,
1912	36,	12,940,	32,	14,014,	50,	22,153,	19,	7,395,	8,	2,694,	15,	5,847,	118,	49,107,	42,	15,936,	160,	65,043,
1913	25,	8,803,	34,	14,183,	31,	13,493,	21,	7,059,	9,	3,083,	7,	2,144,	90,	36,479,	37,	12,286,	127,	48,761,
Three years	87,	29,596,	102,	44,123,	118,	54,086,	46,	16,191,	35,	13,615,	39,	14,276,	307,	127,805,	120,	44,082,	427,	171,883,

Return on medium investments at fixed interest (redemption value not included).

Date.	Home.	Colonial.	Foreign.	Mean (weighted).	Colonial–home.	Foreign–home.	Mean excess over rate on large investments.
1911....	5·05	5·05	5·39	5·20	0·00	+0·34	0·79
1912....	5·18	5·01	5·47	5·26	−0·17	+0·29	0·50
1913....	5·48	5·15	5·79	5·46	−0·33	+0·31	0·48
Three years ...	—	—	—	—	−0·17	+0·31	0·59

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—I. *How the Labourer Lives.*—By B. Seebohm Rowntree and May Kendall. 342 pp., 8vo. London: Thos. Nelson and Sons, 1913. Price 2*s.*

II. *Les Ouvriers Agricoles en Belgique.* Par Benoit Bouché. 261 pp., 8vo. Brussels: Misch et Thron, 1913.

I. "'Potatoes have more stay in them!' said one villager, with deplorable ignorance of food values." It is with such matters that the authors of this work are concerned, with the wages of the agricultural labourer, the things on which his wife spends them and the value of the family's weekly diet, in terms of protein and calories of energy value. On the basis of Professor Atwater's standard of food requirements it is taken "as an established fact that a family of five persons whose total income does not exceed 20*s.* 6*d.* and whose rent is 2*s.*, is living below the 'poverty line'" (p. 30). In the 42 families investigated, the average shortage in protein was found to be 24 per cent., and in energy value 10 per cent. (p. 303). In fact, only one family passed the combined tests, though several had calories to spare. And from this it is concluded that under-feeding is a serious evil in village life, the wife and children suffering more than the man, who as the breadwinner is given a certain minimum by tacit consent in order that he may be able to do his work. The authors lament the continuous exodus from agricultural to industrial life. "The physique of the town population," say they, "in the past has been maintained to some extent by constant reinforcements of the anæmic town dwellers by countrymen. But the source from which these reinforcements have been obtained is rapidly becoming exhausted. Already the country dwellers have given up their best, and the prospect, from the point of view of the maintenance of the national physique, is not bright. It is doubtful whether the health conditions in the cities are being improved as rapidly as the vitality of the country districts is being exhausted" (p. 14). But real wages have at least doubled since 1831. How then did the labourers in the hungry 'forties supply such good stock to the towns? Are we to suppose that these labourers were living on the good stock of the eighteenth century, or that somehow the requirements were less severe then than now? Perhaps in those days they sustained themselves, like certain plants, by affixing nitrogen from the air.

We seem driven into a dilemma. Either the country for the last century has been supplying the towns with inefficient stock, or an efficient stock has issued from a population maintained on something much below the Atwater standard. Furthermore, we are sorry that Mr. Rowntree, with his profound knowledge of Belgium, does not hazard some conjecture as to the comparative value of the labourer's diet in England and abroad. We read, it is true, that "the paid labourer in most Continental countries does not, as a rule, intend to remain a wage earner all his life . . . he is always looking forward to becoming his own master" (p. 19). But looking forward to autonomy, and autonomy itself, do not as such yield proteins and calories.

Finally, though the budgets have been selected from countries with different wage rates, low, medium and high (Oxford, Berks, Essex, Leicester, Yorks), it is not clear at what point in the scale of each village the single budget therefrom selected stands. Many of the families examined cannot pay a little subscription to the village reading room, or join the cricket and football clubs, or go to the parish tea-meeting and harvest thanksgiving. Who then does? Village artisans or better paid agricultural labourers? Or is the explanation this, that for a period of years, 10 to 15, when he has a young family, the agricultural labourer passes through a stage when he can afford none of these things, although he can and does before and after. The frequent allusions to debts owing at the local shops suggests that this may be so: for shopkeepers do not lend unless they are likely to recover one day. "I've never begun to pay off my debts yet," says one woman, "I shall begin, all well, when John is fourteen" (p. 263). We may agree with the North countryman who says that "the farm man who marries without having saved anything is done" (p. 322), but so also is the city clerk—and a great many other people too.

II. M. Bouché's work presents a clear and well arranged picture of the agricultural labourer in Belgium at the present day. Agricultural labour is a problem there as serious as it is with us; for England and Belgium are *par excellence* countries of industry, and, as we read this book, we are reminded again and again of similarities with England. As in England, the soils and, in consequence, the agriculture vary, from the market gardening of the Dunes and the tiny farms of Flanders and the Pays de Herve to the large scale farming on the sandy loam around Namur, and the farming, medium, small and large, in the forest district of the Ardennes. As in England, there is a great scarcity of labour, especially of day labourers and farm servants. We have our own annual immigration of Irish harvesters, and the men of Flanders journey in the summer to the big farms in the south of Belgium or across the French border, to harvest hay, cereals and beetroots. The harvester working by contract in gangs is, indeed, an international institution. Denmark has its Poles, East Prussia its Saxons, and the Argentine has its Italians, who yearly make their journey across the ocean. As in England, agricultural wages in Belgium have risen during the last 50 years from a starvation level, such as we had in the hungry 'forties, to a rate at least double. In the author's tables of wages for day labourers the most frequent figures for summer and winter rates are 3 fr. (2*s.* 6*d.*) and 2.50 fr. (2*s.* 1*d.*) respectively—sums hardly up to the average in England, if we include extras, which are not so frequent or considerable in Belgium. But the rates vary very much from district to district, being highest in districts of large farms, which are also the districts from which the drain to the towns and the mines is most acute. This is an interesting fact. For in England the low wage counties are in the east and south, with their big farms and traditions of feudalism and charitable aid; while the well-paid labourer of the north lives in an industrial environment, and works much harder, so it is said. In Belgium the low wages occur in Flanders and the Campine, where small cultivators, the hardest workers of all, are most numerous and where the industrial alternatives are fewer. This suggests that the action of industry in curtailing the supply of rural labour—the common element in the high wage districts of both countries—is the most powerful cause of high wages in agriculture.

But between England and Belgium there is one supreme difference. The Belgium labourer is a bird of passage, literally so where he is a migrating task worker, and in effect so in other cases; for the labourer only stays on the land if he can become a small cultivator for himself. "Ce n'est que lorsque l'ouvrier agricole sera petit cultivateur autonome ou ouvrier industriel permanent qu'il sera fixé" (p. 37). Hence in Belgium "la terre se loue plus cher en détail qu'en gros." Ownership of the soil, though in many hands, is nevertheless denied to the majority. But all are candidates for access to it, not merely the small self-supporting cultivator, but also the industrial worker, who by cheap railway fares is able to live in the country and works there his strip of ground. The result is something quite alien to English experience: "Ce sont ces petits cultivateurs qui constituent le véritable prolétariat des champs" (p. 89); and this being so, there is still a chance in the country for socialist propaganda on co-operative lines. The industrial population being more evenly distributed, urban rents are not so high as in England, but M. Bouché calculates that accommodation costing £5 12*s.* per annum in the country is represented by a figure of £7 5*s.* in the town, while the price of foodstuffs is lower for country districts in all articles but sugar. In England the difference of rents is greater, but the countryman is said to pay more for the things he buys at the shop. Finally, Belgium has evolved a custom, which must surely be almost unique in the world. So great in some parts is the scarcity of labour that the farmer regularly does services for his labourers, ploughing, carting, etc., and for these "corvées" the labourer in return condescends to help the farmer with his hands: "C'est le fermier qui est devenu le 'vassal' du manœuvre" (p. 171). C.R.F.

2.—*Co-operation in agriculture.* By G. Harold Powell. xv + 327 pp., 8vo. New York: The Macmillan Company, 1913. Price 6*s.* 6*d.*

The co-operative movement among farmers in the United States is part of the revolt against the powerful organisations which, by obtaining complete control over distribution, have rigged the market to the detriment alike of the producer and of the consumer. Mr. Powell, who is the general manager of the Californian Fruit Growers' Exchange, has contributed to the Rural Science Series a volume which explains in a lucid way the vicious features of the existing system and the measures taken by farmers to protect their interests. Its value would have been increased by the addition of some short tables giving leading statistics of the classes of farmers' co-operative societies described.

Mr. Powell states that in the fruit trade the producers get only one-third of the retail price, the railway companies and the other distributing agencies dividing the remaining two-thirds. In his VIIth Chapter there is a clear account of the complicated machinery which distributes the cotton crop, with the result that the grower is forced to sell it as soon as it is harvested to satisfy his creditors, and to take whatever price is offered. The ramifications of the trusts are sometimes curious. In New York State "the largest dealer in milk is the Borden's Condensed Milk Company, which is closely identified with the Standard Oil Company" (page 153). It is small wonder that "the conviction has been growing that the system of distributing farm products has become so complicated . . . as to form one of the leading factors in the increase in the cost of living and in reducing the profits of the producer below that which his capital and labour warrant" (page 198).

The victims of the abuses created by rings and trusts have pinned their faith on one or more of three proposed remedies, regulation by law, State and municipal ownership of the means of distribution, and co-operation among the producers. It would be foolish to depend wholly on laws and prosecutions. The second expedient is growing in popularity in the United States, and Mr. Powell sees clearly that the final choice lies between Socialism and Co-operation. He rightly insists that co-operative societies as such should hold themselves aloof from the strife of parties. This, of course, does not mean that farmers must abstain from forming separate associations to look after their political interests.

A powerful Association with 3,000,000 members has been formed, whose full title is "The Farmers' Educational and Co-operative Union of America," but which is usually known as "The Farmers' Union." It is an active force in politics. According to its charter its object is "to assist (farmers) in marketing and obtaining better prices for their products, for fraternal purposes, and to co-operate with them in the protection of their interests." Its published programme sandwiches practical aims, such as the teaching of scientific farming and the elimination of gambling by speculators in farm produce between high flying items like the establishment of justice and "to garner the tears of the distressed, the blood of martyrs, the laugh of innocent childhood, the sweat of honest labour, and the virtue of a happy home." It has fought the cotton rings by the legitimate weapons of co-operative warehousing and the establishment of selling agencies. In order to raise prices it has adopted the much more doubtful expedients of exhorting its members to reduce the outturn by lowering the acreage under cotton and making a corresponding reduction in their purchases of fertilisers.

In his first chapter Mr. Powell explains why, in an age of ever-increasing organisation and combination in trade, farmers as a class long clung obstinately to the old individualistic methods. Most of the reasons are common to the farming industry everywhere, especially where farms are not very small. But the slowness of the American farmer in changing his ways has been largely due to the fact that on the whole he has been very prosperous in the last twenty years. As Mr. Powell remarks—"An agricultural organisation must be the child of necessity and must crystallise around a vital economic question." The second chapter on "Fundamentals in Co-operation" covers familiar ground. Chapters III to V deal with the legal position, organisation, and financing of agricultural co-operative societies. In most States there are still no Acts corresponding to our "Industrial and Provident Societies' Act" and "Friendly Societies' Act." The societies have to be registered and are exposed to the temptations of ordinary joint stock companies, though it is possible to adopt in practice the leading features of co-operation, a moderate fixed dividend on shares, and the division of any surplus profits among the members in proportion to the amount of business they have brought to the Society.

Chapter VI describes co-operative efforts to improve production of crops and stock. So far this branch has not been largely developed. Some of the Californian Fruit Growers' Associations undertake co-operative pruning, fumigation, and spraying as part of their regular business.

The next two chapters, the most important in the book, deal with the co-operative distribution and sale of farm products, including grain, butter, milk, eggs, cotton and fruit. By building their own grain elevators, farmers have succeeded in breaking the rings of middlemen. But the societies which they have formed for that purpose are by no means all co-operative. The account given in Chapter VIII of the co-operative distribution and sale of fruit is full and interesting. The result has been to reduce the cost of packing and handling the huge orange crop of California by one half, and to lower the retail price so much that "the orange has been transferred from a luxury to a staple article of diet" (page 218). It is here that the American movement has succeeded best, and the chapter is well worth the attention of the English fruit farmer.

It is difficult to discover from Mr. Powell's remarks what is the real extent of co-operation for the purchase of requirements, the main business of our English societies. As he disposes of the subject in the space of eight pages, this branch of co-operation is apparently of secondary importance in the United States.

Chapter X gives an interesting account of co-operation in providing irrigation in the arid tract in the Western States. Rural credit, the telephone, and insurance are the subjects of the last three chapters. Co-operative credit is hardly more developed than in England, but attention is now being devoted to the subject. The small farmer is often hopelessly tied to a local dealer or to some auction company which advances money in exchange for a lien on the crop.
J.M.D.

3.—*L'Industrie et les Industriels.* Par Yves Guyot. xxviii + 356 pp., 8vo. Paris: Doin et Fils, 1914. Price 5 francs.

This volume forms part of an Encyclopédie Scientifique which will include about a thousand volumes: in the political economy section 42 volumes are planned, of which ten have now appeared. The volumes are of convenient size and well bound and printed, but their weight is disproportionate to their bulk and makes them less pleasant to handle. Besides the book now before us, M. Guyot has contributed to the series another on "Le Commerce et les "Commerçants" (already published), and a third entitled "La "Valeur. Les Prix" is still to appear. In an introductory chapter he lauds invention in terms which relate the volume to his well-known political theories. "These inventions," he says, "have "not been realised by governments, but by individuals who in "following them out have had gain for their object. This moving "force is the great factor of the industrial revolution." The remainder of the treatise is divided into seven Books: the problem of industry, the relations between fixed and circulating capital, capital and industry, labour, cost price and market price, profit and loss, conclusion and summary. He opens with a sketch of the elementary economics of industry, and here his beautifully clear-cut sentences are apt to produce a deceptive semblance of precision. Dr. Marshall's definition of capital is "those kinds of wealth, other "than the free gifts of nature, which yield income that is generally "reckoned as such in common discourse: together with similar "things in public ownership, such as government factories." This is both more intelligible and more in accord with common usage than M. Guyot's more epigrammatic phrase, "capital comprend "toute utilité faisant fonction économique," and our prejudice in favour of what we learned as students is not lessened when we find that M. Guyot goes on to insist that "millions invested in a "battleship are capital." Again, we seem to find bad history and defective analysis in his statement that the old economists did not include "land" under capital because they were dominated by the old feudal law which confounded landed property with sovereignty. Price, he further tells us, is determined by four elements: the cost price of the object or service offered, the purchasing power of the negotiating parties, the quantity of the objects or services to be exchanged, and the intensity of the needs of the parties. Here M. Guyot's usual precision of statement fails him, for he knows quite well that once an object has been produced its value in exchange is not affected by its cost; on the other hand, cost is an important factor as affecting the continued reproduction of an article. His comments on the "law of decreasing returns" are more superficial than comprehensive.

M. Guyot treads more surely when, with a running commentary of figures, he expounds how industrial progress proceeds by saving in raw materials, by reducing expense through by-products, by utilising matter formerly useless, and by improving transport. He then examines the supply of capital in the different French industries, and finds it to be sufficient, whether the business has a family form or takes the form of a joint stock company. The large credit establishments have, he adds, "helped in the foundation "and development of most of the great French enterprises," and he quotes an interesting list of businesses so financed. Having established that neither capital nor credit are lacking for French industry, he naturally can see no reason for interfering with the right of the individual to "export" his capital. Wages he regards as regulated by supply and demand, but maintains that the interest of the employer is that his workpeople should earn as much as possible. The labour contract is to him a contract of exchange, and there is no more inequality between the parties to the contract than there is in the case of every contract, as one party is always more anxious to deal than the other. He is as opposed to paternalism as to socialism, and his well-known individualist views are evident in such phrases as "the question of the protection of adult labour "has been introduced hypocritically by the protection of women," and by such conclusions as that a compulsory law for a Sunday rest is absurd and unjust! Trade unions, he says again, being fighting organisations, are not fitted to establish collective labour contracts. "The solution of the problem of the organisation of labour in "industry is the institution of labour co-operative societies" in which each of the members would be a shareholder; "they would "have no other object than to bargain for the products or services "resulting from the labour of their members and to guarantee the "execution of the labour contract." This project for the wholesale purchase and sale of labour is developed at greater length than we can deal with here.

The discussion of the various wage systems, of the German insurance laws, of the relations between cost price and market price, of protection, of the cost of production, of standing charges, of expenses of sale, of the methods of reckoning profit, and of the American Industrial Census occupies the rest of the book, and on each of these topics M. Guyot has something interesting or provocative to say. The reader will not find the book dull; as every one knows, M. Guyot is a lively and unconquerable controversialist.

H.W.M.

4.—*Les crises industrielles en Angleterre.* Par Michel Tougan-Baranowsky. Traduit sur la 2ᵉ Édition Russe, revue et augmentée par l'auteur, par Joseph Schapiro. vii + 476 pp., 8vo. Paris: Giard and Brière, 1913. Price 12 francs.

This book is divided into three parts. The first gives an historical account of English crises; the second deals with theory; and the third, the strongest portion of the work, with the effect of trade cycles on political and social movements among the working classes. In the theoretical part, explanations of industrial crises (using the word "crisis" in a general sense, as the writer or translator does, and not in the special sense implying financial collapse or its imminence), are classified into the productive, those tracing crises to phenomena of exchange, and the distributive. The author's theory is of the productive and distributive orders. The three things that make crises inevitable, according to him, are (1) the capitalistic competitive system, with labour as a mere factor in production; (2) the tendency in such a system towards unlimited production, owing to the accumulation of capital; and (3) lack of organisation, to secure a methodical distribution of wealth. There is not a little of Marx in the theory. The author finds the great variations in the price of iron very significant; Henry George, whose bias was to another diagnosis of social troubles, regarded inflation of land values as the most significant thing. Iron, of course, stands for the instruments of production. It is not proved that fluctuations in the price of iron have more significance than anything else, and the proof would be difficult in view of the orthodox account of their magnitude which holds the field. The author finds a marked contrast between early crises and those of late years and maintains that the cause is two-fold—the declining importance of England in the world's trade and the fact that she now exports a far greater proportion of productive instruments. The first may be a *vera causa*; but whether the second is really weighty, is open to question. The argument relied upon is that instruments of production, being mainly produced to order, are not the objects of speculative production. But this does not seem to matter much if they are ordered to provide the means of making things produced speculatively. When bad trade comes the hardware industries may have comparatively small stocks, but they have much idle plant. The fact that unemployment is always worst in these industries rather tells against the argument. Many suggestive points will be found throughout the book; and the perusal of the third part in particular is recommended to all students of social history. S.J.C.

5.—*Other New Publications.**

Augstin (*Dr. Max*). Entwicklung der Landwirtschaft in den Vereinigten Staaten von Nordamerika und ihr Einflus auf die Preisbildung Landwirtschaftlicher Erzeugnisse. 149 pp., 8vo. München: Duncker and Humblot, 1914.

[This book, by a student of the Royal Agricultural College of Berlin, is based on the observations of a journey through the agricultural districts of the United States, and describes the development of agriculture in the United States, and its influence on prices of agricultural produce. There is a supplement on dry-farming and an appendix of statistical tables.]

Best (*R. H.*) and *Ogden* (*C. K.*). Problem of continuation school and its successful solution in Germany. A consecutive policy. xv + 80 pp., 8vo. London: P. S. King and Son, 1914. Price 1*s.* net.

[A description of the compulsory trade continuation schools in Germany, especially in Munich. Emphasis is laid on the benefits the schools have conferred in securing for boys employment in definite trades and saving them from "blind alley" occupations. The authors advocate, with certain restrictions, the adoption of this system in England.]

Dale (*Bernard*). The effect of taxes on food-stuffs. When and why a tax on food-stuffs does not increase the cost to the consumer. xv + 64 pp., 8vo. London: Effingham Wilson, 1914. Price 2*s.* net.

[The author's aim is to explain in the light of the doctrine of marginal utility, that a duty on imported food-stuffs does not increase the cost to the consumer.]

Keeling (*Frederic*). Child labour in United Kingdom. A study of development and administration of the law relating to employment of children. xxxii + 326 pp., 8vo. London: P. S. King and Son, 1914. Price 7*s.* 6*d.* net.

[A comprehensive survey of the different branches of the child labour problem, and of the existing administrative measures for its regulation and protection. The book is divided into six parts, in addition to an introduction which contains a useful outline of the history and present position of child labour legislation in this country. The development and administration of child labour regulation are described in Parts 1 and 2; Parts 3 and 4 deal with the action and powers of local authorities in regard to children, and Part 5 with the law relating to the employment of children. There is also a Bibliography and indices of places, persons and subjects.]

Lescure (*Jean*). L'Epargne en France. viii + 114 pp., 8vo. Paris: Larose and Tenin, 1914. Price 2 fr. 50 centimes.

[A translation from the German report on thrift in France, prepared for the "Verein für Sozialpolitik" in connection with its inquiry into thrift in different countries. There is an appendix of statistical tables relating to operations of savings banks and other provident institutions for a series of years.]

Mendelson (*Dr. M.*). Die Entwicklungsrichtungen der deutschen Volkswirtschaft . . . vi + 75 pp., 8vo. Leipzig: A. Diechert'sche Verlagsbuchhandlung, 1913. Price 1 mark 80 pf.

[A statistical account of the economic progress of Germany in recent years as shown by the increases in its population, production and other indications of wealth and industrial activity.]

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* See also "Additions to the Library," page 456, *sqq*.

Musgrave (Charles E.). The London Chamber of Commerce from 1881 to 1914. A Retrospective Appreciation. viii + 93 pp., 8vo. London: Effingham Wilson, 1914. Price 2*s.* 6*d.* net.

[A short account of the foundation of the London Chamber of Commerce, and of its development and activities in commercial affairs. Some special features of the Chamber's work are described, and there is a short account of the many economic and social changes that have taken place during the past thirty-two years in business methods generally.]

Perlmann (Louis). Bewegung der Weizenpreise und ihre Ursachen. 73 pp., 8vo. München: Duncker and Humblot, 1914.

[A short statistical study of the changes in the prices of wheat over a series of years in different countries, and of the causes of these changes.]

Spalding (William F.). Foreign Banking appointments. An epitome of the conditions governing entry into the principal foreign and colonial banks, with some account of the prospects offered. 28 pp., 8vo. London: W. F. Spalding, 1913. Price 1*s.* net.

Struyck (Nicolas). Les œuvres de Nicolas Struyck (1687-1769) qui se rapportent au Calcul des Chances, à la Statistique Générale, à la Statistique des Décès et aux Rentes Viagères, tirées des œuvres complètes et traduites du Hollandais par J. A. Vollgraff. vii + 432 pp., 8vo. Amsterdam, 1912.

[This translation of the works of Nicholas Struyck was prepared by the "Société générale néerlandaise d'assurances sur la vie" in connection with the Seventh International Actuarial Congress at Amsterdam in 1912. It includes only such of his works as deal with the laws of chance, statistics of mortality and life annuities. Struyck was elected a Fellow of the Royal Society in 1749, though he never signed the register.]

Thszka (Dr. Carl von). Löhne und Lebenskosten in Westeuropa im 19. Jahrhundert (Frankreich, England, Spanien, Belgien). Nebst einem Anhang: Lebenskosten deutscher und westeuropaischer Arbeiter fruher und jetzt. 291 pp., 8vo. München: Duncker and Humblot, 1914.

[A comparative economic and statistical study of wages and prices and the cost of living generally in France, England, Spain and Belgium over a series of years which varies for the different countries named.]

Usher (Abbott P.). The History of the Grain Trade in France, 1400-1710. xv + 405 pp., 8vo. Cambridge: Harvard University Press, 1913.

[This study was undertaken at the suggestion and with the assistance of Prof. E. F. Gay, whose lectures the author attended. It deals with the development of the grain trade in France over the period in question, and also with the restrictions and regulations made at different times by the State and local authorities for its administration. The book is divided into ten chapters, and contains also a list of the French dry measures of the old regime, a glossary of administrative terms, a Bibliography and an index.]

Virgilii (F.). Statistica. Sesta Edizione rifatta. (Manuali Hoepli Serie Scientifica 107.) xx + 228 pp., sm. 8vo. Milano: Ulrico Hoepli, 1914. Price 1 lire 50 c.

[The first edition of this little manual was reviewed in the *Journal* for 1891, and the 5th edition was noted in the *Journal* for January, 1911. In the present 6th edition, the text has been revised and brought up to date.]

Williams (*R.*). First Year's Working of Liverpool Docks Scheme. (The Liverpool Economic and Statistical Society.) 192 pp., 8vo. Liverpool: The Northern Publishing Co., Ltd., 1913. Price 2*s*. 6*d*. net.

[This book gives a full account of the working of the scheme for the better organisation of dock labour and of the many difficulties inherent to the subject which had to be overcome in its inception. It does not claim to be a final solution of the problem, but only a temporary expedient to lessen the evils of casual employment. The book contains valuable statistical data bearing on the subject.]

Bulgaria. Enquête sur l'Industrie encouragée par l'État en 1909. liii + 140 pp., 8vo. Sophia: Imprimerie de l'Etat, 1913.

[Industries receiving State aid are obliged by law to forward yearly to the Ministry of Commerce a statement of their condition and working, but owing to their incompleteness and want of accuracy they are of little value for inquiries of this nature. The present inquiry was conducted by the State Statistical Department and is confined to those industries receiving State aid. Details are given of the method employed in obtaining the statistical data which, among other matters, deal with the capital invested, the motive power, the production of the different commodities, and the wages and hours of labour of employees.]

Germany. Die Verbände der Arbeitgeber, Angestellten und Arbeiter im Jahre 1912. 8. Sonderheft zum Reichs-Arbeitsblatte. 55 + 67 pp., fol. Berlin: Carl Heymanns Verlag, 1914. Price 3 marks 20 pf.

——— Die internationalen Beziehungen der deutschen Arbeitgeber-, Angestellten- und Arbeiterverbande. 9. Sonderheft zum Reichs-Arbeitsblatte. 133 pp., fol. Berlin: Carl Heymanns Verlag, 1914. Price 3 marks 20 pf.

Russian Year-Book for 1914. Compiled and edited by H. P. Kennard, M.D., assisted by Netta Peacock. 8vo. London: Eyre and Spottiswoode, Ltd., 1914. Price 10*s*. 6*d*. net.

[This is the fourth issue of the Russian Year-book, which furnishes in a handy form a useful survey of the recent economic progress of Russia. The information given is largely compiled from official papers, and is well up to date. Its accessibility is increased by the inclusion of a good index.]

CURRENT NOTES.

The trade returns for the past month are fairly satisfactory. Imports show a decline in value, but this is largely due to lower prices. Exports show a satisfactory advance in value. The subjoined figures compare the twelve months ending February, 1914, with the twelve months ending February, 1913:—

[000's omitted.]

Imports.	Twelve months ending February, 1914.	Twelve months ending February, 1913.	Increase (+).
Imports, value c.i.f.—	£	£	£
I. Food, drink and tobacco	290,607,	281,305,	+ 9,302,
II. Raw materials and articles mainly unmanufactured	279,291,	277,903,	+ 1,388,
III. Articles wholly or mainly manufactured	194,306,	186,573,	+ 7,733,
IV. Miscellaneous and unclassified (including parcel post)	3,092,	2,932,	+ 160,
Total merchandise................	767,296,	748,713,	+ 18,583,
Imports of bullion and specie	73,763,	69,670,	+ 4,093,

[000's omitted.]

Exports.	Twelve months ending February, 1914.	Twelve months ending February, 1913.	Increase (+) or Decrease (−).
Exports of produce and manufacture of the United Kingdom, value f.o.b.—	£	£	£
I. Food, drink and tobacco	32,854,	32,647,	+ 207,
II. Raw materials and articles mainly unmanufactured	70,347,	59,739,	+ 10,608,
III. Articles wholly or mainly manufactured	411,878,	387,308,	+ 24,570,
IV. Miscellaneous and unclassified (including parcel post)	11,471,	10,211,	+ 1,260,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	16,085,	15,129,	+ 956,
II. Raw materials and articles mainly unmanufactured	63,380,	67,153,	− 3,773,
III. Articles wholly or mainly manufactured	29,533,	29,311,	+ 222,
IV. Miscellaneous and unclassified (including parcel post)....	139,	166,	− 27,
Total, British, foreign and colonial	635,687,	601,664,	+ 34,023,
Exports of bullion and specie	64,785,	64,827,	− 42,

[000's omitted.]

Shipping.	Twelve months ending February, 1914.	Twelve months ending February, 1913.	Increase (+).
	Tons.	Tons.	Tons.
Total, British and foreign, *entered* with cargoes	49,022,	46,451,	+ 2,571,
Total, British and foreign, *cleared* with cargoes	67,962,	62,077,	+ 5,885,

Mr. Sauerbeck's index-number of prices for February, as given in the *Statist*, is 83·8, as against 83·5 in January, the average of the eleven years 1866-77 being taken as 100. The recovery has been caused mainly by a fresh advance in the prices of animal food, a small rise in vegetable food, and a moderate advance in the price of textiles. The advance in prices has, however, not been general, as minerals have fallen somewhat heavily. Articles of food were 76·2 as against 75·0 in January, and materials 89·4 as against 89·7. The *Economist* index-number stands at 2,622 as compared with 2,624 in January.

According to the Board of Trade *Labour Gazette*, the state of the labour market last January was as follows:—

	Trade Unions making returns. Net membership.	Reported as unemployed.	
		Number.	Percentage.
January, 1914	962,242	24,548	2·6
December, 1913	965,500	25,229	2·6
January, 1913	884,444	19,498	2·2

Employment in January was good on the whole, and showed no marked change compared with the previous month. The engineering and ship-building trades continued busy, and employment at coal-mines was still very good. There was, however, a further falling-off in the textile industries, especially in cotton-weaving. The seasonal decline in the building trades continued, and there was some slackening in the brick, pottery and glass trades. It was reported by the Labour Exchanges that there was a continuance of the demand for labour in the ship-building trades. A deficiency in the supply of women was reported in the linen trades, and some shortage was experienced in the clothing trades and in laundry work. Wages in the iron and steel trades continued to fall; in other trades there was still an upward movement. Compared with the high level of January, 1913, employment showed a falling-off. There was a marked decline in the pig iron, iron and steel and tinplate trades, and the engineering and ship-building trades were not so fully employed. There was also a decline in the textile industries, which was particularly noticeable in cotton-weaving, in the woollen and worsted trades generally, and in some branches of the lace trade.

A report has been issued by the London County Council surveying the work of the Council since its formation until March 31, 1913. The *Annual Report of the London County Council* deals only with the year in respect of which it is issued, whereas the present volume indicates not only the power and duties of the Council over the whole of the period under survey, but the circumstances in which those powers and duties were obtained. The volume thus forms a comprehensive record of unusual interest, and Sir Laurence Gomme, who is responsible for its preparation, is to be congratulated upon the thoroughness with which the work has been carried out.

The *Quarterly Journal of Economics* for February contains, among other interesting matter, an article by Dr. Bowley on "The British "Super-tax and the Distribution of Income." After summarising earlier estimates of income-distribution and describing the additional information available since 1907-09, Dr. Bowley makes a comparison of the new data with Pareto's law dealing separately with incomes below 700*l*., above 5,000*l*., and intermediate between these limits. "The law for the lower range shows an aggregate income of 251,000,000*l*. for the 880,000 persons with incomes from 160*l*. to 700*l*., and from the data with or without the law a sum very near this must be obtained. Taking this amount in conjunction with the known amount above 5,000*l*. and the known total it is found that 414,000,000*l*. is to be accounted for between 700*l*. and 5,000*l*. This is very much more than the 142,000,000*l*. which the lower law would give if it were continued, and more even than the 304,000,000*l*. which the upper law would give if continued back, and not far from the two combined." Dr. Bowley points out that no complete explanation of this very considerable discontinuity can be given, and offers a conjecture on the following lines. "There is nothing unreasonable in the supposition that earned incomes follow a law nearly independent of unearned incomes. People with small earnings may be the accidental owners of capital, and people with large capital may also make large earned incomes; but the joint possession of such double incomes, though quite common, may be regarded as accidental." The statistics suggest that a very considerable part of the incomes below 700*l*. is earned and that the major part of incomes over 10,000*l*. is unearned.

In the region between 700*l.* and 10,000*l.* there must be a large proportion of mixed incomes. It is suggested that "the two Pareto gradings tend to represent respectively incomes arising from earnings and incomes arising from property, though if the lower were purified of property and the upper of earnings, both lines would be lowered and the aggregates would be less. Then in the intermediate region (700*l.* to 10,000*l.* and more especially to 5,000*l.*) we should tend to find the aggregate resulting from the two laws, as is in fact the case. The upper law gives 212,000 incomes in this region and a much greater number below 700*l.*, the lower gives 102,300 in this region: on the hypothesis of mixed incomes these numbers are not independent, and the number of persons is between 200,000 and 300,000. Whatever be the explanation of this discontinuity, there is certainly presumptive evidence for an aggregation of incomes in this intermediate region of the moderately rich. As to their number, if the average income between 700*l.* and 5,000*l.* were 1,500*l.*, the number would be 280,000; if the average were 2,500*l.* it would be 165,000. A number about 200,000 and an average about 2,000*l.* seem to fit the facts best." The discussion is summarised in the following table:—

*Estimates of personal taxable income in the United Kingdom.**

	Number of persons.	Aggregate income.	
		£	
160*l.*—700*l.*	880,000	250,000,000	Too small if abatements are not claimed.
700*l.*—5,000*l.*	200,000	415,000,000	The number is conjectural.
5,000*l.* and over	12,000	145,000,000	Too small if there is evasion, or if the difference of definition is numerically important.

* Including income subject to abatement.

A Paper recently read before the Royal Society of Medicine by Dr. Dudfield, on "Still-births: The case for their compulsory registration and definition," has been reprinted in pamphlet form. This paper covers largely the same ground as the Paper previously read by Dr. Dudfield before the Royal Statistical Society. There is a full report of the discussion on the Paper, in which Dr. Hamer, Dr. W. S. A. Griffith (President of the Obstetrical Section), Dr. T. H. C. Stevenson (of the General Register Office), Dr. Amand Routh and others took part.

The Report has been issued of the Proceedings of the English-Speaking Conference on Infant Mortality held at Caxton Hall, Westminster, on August 4 and 5, 1913. The Conference, though in a series with the two which preceded it in 1906 and 1908, is yet distinct from them in that this year, for the first time, it was conducted under the auspices of the National Association for the Prevention of Infant Mortality and for the Welfare of Infancy, and not, as heretofore, by a special and independent committee. The new Association, which was founded in June, 1912, is an amalgamation of the original Executive Committee on Infant Mortality, with representatives from a number of other associations and societies interested in child welfare. This year's conference was distinguished from that of 1906 and 1908 in embracing representatives from every English-speaking country. Twenty-two English-speaking Governments were officially represented by specially appointed delegates.

The first number has been issued of the *Political Quarterly* under the editorship of Professor W. G. S. Adams. This journal will deal with contemporary questions of social and political development, and should be of permanent value to all students of politics and economics. It is intended, however, to be of special service to students in the United Kingdom, in so far as its aim will be to present not only articles on important questions of the day, but also systematic records of the work of Parliament and of developments in central and local administration. At the same time the *Political Quarterly* is intended to be a journal of comparative politics, and to contain articles and reviews from representative men in the British Dominions and foreign countries. The first number contains two anonymous articles on the Home Rule situation and the Dublin labour dispute respectively, a review of the political year 1913 in Canada, by Professor O. D. Skelton, of Ontario, and an equally interesting survey of Parliament and public administration in the United Kingdom. Other articles are "The Amendment of the "United States Senate," by the Hon. Henry Cabot Lodge, Senator for Massachusetts, "Registration of Title to Land," by Sir C. F. Brickdale, Registrar of the Land Registry, "Municipal Government "in Birmingham," by Mr. Norman Chamberlain, Member of the Birmingham City Council, "The School in Relation to Civic "Progress," by Mr. J. L. Paton, High Master of the Manchester Grammar School, and "The State in Recent Political Theory," by Mr. A. D. Lindsay, Fellow and Tutor of Balliol College, Oxford.

Professor Paul Géorgièvsky, of the University of St. Petersburg, has been appointed President of the Statistical Council of Russia.

He is succeeded as Director of the Central Statistical Committee of the Ministry of the Interior by Professor Nicholas Béljavsky.

The preparation of Mr. Sauerbeck's annual article on Prices of Commodities has now been undertaken by Sir George Paish, of the *Statist*. The article, which has hitherto appeared in the March issue of the JOURNAL, will this year be published in the April issue.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Bankers' Magazine. March, 1914—The central reserve: *Palgrave (Sir Inglis).*

Economic Journal. March, 1914.—Political Economy in the light of marginal theory: *Wicksteed (P. H.).* The development of German Syndicates: *Macgregor (Prof. D. H.).* Industrial credit and imprisonment for debt: *Whitelock (W. H.).* The economic activities of modern Jewry: *(Cohen I.).* The United States federal income tax: *Seligman (Prof. E. R. A.).* The new banking measure in the United States: *Mitchell (Prof. W. C.).* The Leeds municipal strike and a rejoinder: *Greenwood (Arthur)* and *Sadler (Michael E.).* Currency in 1912: *Keynes (J. M.).* The Trade Boards Act: *Keeling (F.).*

Financial Review of Reviews. March, 1914—Naval expenditure and the investor: *Hannon (P. J.).* The new railway régime: *Lawson (W. R.).* The income tax system: *Sanders (William).*

Political Quarterly—The Home Rule situation: (*a*) The Ulster question; (*b*) The financial arrangements. The State in recent political theory: *Lindsay (A. D.).*

UNITED STATES—

Journal of Political Economy. February, 1914—The tariff of 1913: *Willis (H. Parker).* Some aspects of the minimum wage: *Millis (H. A.).* Public capitalisation of the inheritance tax: *Johnson (Alvin S.).*

Quarterly Journal of Economics. February, 1914—The federal reserve act of 1913: *Sprague (O. M. W.).* The British supertax and the distribution of income: *Bowley (A. L.).* The development by commissions of the principles of public utility valuation: *Heilman (Ralph E.).* The social point of view in economics: *Haney (Lewis H.).* Some economic aspects of the new long and short haul clause: *Clark (J. M.).* Industry in Pisa in the early fourteenth century: *Dietz (F. C.).* Mediation and arbitration of railroad wage controversies: a year's development: *Powell (Fred. Wilbur).*

AUSTRIA—

Statistische Monatschrift. December, 1913—Zur Statistik der Kleinhäuser in Österreich: *Kuttelwascher (Dr. Hans).* Zur Geschichte der Finanzstatistik in Österreich: *Meyer (Dr. Robert).* Die vorläufigen berufsstatistischen Ergebnisse der Volkszählung vom 31. Dezember 1910: *Hofmann (Dr.).* Die Gesellschaften mit beschränkter Haftung im Jahre 1912: *Oberndorff (Karl Graf).*

FRANCE—

Bulletin de Statistique, Ministère des Finances. January, 1914—Le projet de budget rectifié pour l'exercice 1914. Allemagne.—Le produit de l'impôt impérial sur les successions en 1910 et en 1911.

Journal des Économistes. February, 1914—L'évolution et les régressions fiscales : *Guyot* (*Yves*). Une revanche de la douane : *Paturel* (*Germain*). Les premiers résultats de la nouvelle loi anglaise d'assurance sociale : *Bellom* (*Maurice*). L'État auxiliaire du commerce : *Nouvion* (*Georges de*). Le Conflit sur le Nord-Atlantique : *Hochschiller* (*Max*). L'importance de l'industrie cotonnière en Grande-Bretagne : *Bellet* (*Daniel*). Mouvement agricole : *Molinari* (*Maurice de*).

Journal de la Société de Statistique de Paris. February, 1914—La statistique des fonctionnaires : *March* (*Lucien*). L'assistance aux vieillards (France et Angleterre) : *Malzac* (*M.*). Chronique des banques et questions monétaires : *Roulleau* (*M. G.*).

GERMANY—

Archiv für Sozialwissenschaft und Sozialpolitik. January, 1914—Ueber den Subjektivismus in der Preislehre : *Zwiedineck* (*Prof. Otto V.*). Ueber einige in der Natur des Beobachtungsobjektes liegende Schwierigkeiten des volkswirtschaftlichen Forschens : *Brentano* (*Prof. Lujo*). Die Probleme der wirtschaftlichen Dynamik : *Amonn* (*Prof. Alfred*). Betrachtungen über die Grundlagen der politischen Parteibildung : *Sulzbach* (*Dr. Walter*). Die italienische Mutterschaftversicherung und ihre Bedeutung : *Michels-Lindner* (*G.*). Agrarische Sozialpolitik.

Deutsches Statistisches Zentralblatt. January, 1914—Die Methode der Sterblichkeitstafel und ihre Anwendung auf andere statistische Probleme : *Landsberg* (*Prof. Dr. O.*).

Jahrbücher für Nationalökonomie und Statistik (*Conrad's*). *February*, 1914—Die Fleischteuerungsfrage : *Conrad* (*J.*). John Stuart Mill als Sozialpolitiker : *Gehrig* (*Hans*). Zur badischen Eisenbahngeschichte : *Müller* (*Ernst*). Statistische Uebersicht über die Ehescheidungen in den wichtigsten Kulturländern : *Müller* (*Johannes*). Der Kursstand der deutschen Staatsanleihen : *Heinemann* (*Ernst*). Die Landswirtschaft Schwedens. Die Reform der juristisch - staatswissenschaftlichen Studien in Oesterreich nach den Vorschlägen der Kommission zur Förderung der Verwaltungsreform : *Kleinwaechter* (*Friedrich*).

Zeitschrift des Königlich Preussischen Statistischen Landesamts. Abteilung 1, 1914—Die Fideikommisse in Preussen im Lichte der Statistik bis zum Ende des Jahres 1912 : *Höpker* (*Dr. H.*).

Zeitschrift für die gesamte Versicherungs - Wissenschaft. March, 1914—Die hauptsächlichsten Unterschiede der Invaliden- und Hinterbliebenenversicherung nach der Reichsversicherungsordnung und dem Versicherungsgesetz für Angestellte : *Sitzler* (*Dr.*). Über die technischen Rechnungen bei der Pensionsbemessung nach Gehaltsdurchschnitten : *Parthier* (*H.*). Die geplante norwegische soziale Volksversicherung : *Bugge* (*N. L.*).

ITALY—

Rivista Critica di Scienze Sociali. January, 1914—La legge-ipotesi fondamentale della scienza finanziaria: *Murray (Roberto A.)*. La teoria delle crisi: *Alberti (Mario)*.

INTERNATIONAL—

Bulletin trimestriel de l'Association internationale pour la Lutte contre le Chômage. January-March, 1914—Rapports sur l'assurance-chômage. Rapports sur le chômage et les travaux publics.

MONTHLY LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since February 8, 1914, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Austria—

Kataster der Gewerbegenossenschaften und deren Verbände in Böhmen. Abteilung I. Band vi. Erster Halbband. La. 8vo. 1913. (The Ministry of Commerce.)

Bulgaria—

Census. Résultats généraux du Recensement des Bâtiments, 31 Déc. 1910. 17 pp., 4to. 1913. (The Statistical Bureau.)

Denmark—

Copenhagen—

Statistiske Oplysninger, 8, om Kobenhavn og Frederiksberg 1908-12. 8vo. 1914. (The Municipal Statistical Bureau.)

Tabelværk til Kobenhavns Statistik. Nos. 18 and 19. (Census Feb. 1, 1911.) 2 vols., 4to. 1913. (*Id.*)

Iceland. Recensement de la population de l'Islande, le 1er Décembre 1910. xvii + 198 pp., la. 8vo. 1913. (The Statistical Bureau of Iceland.)

Egypt—

Vital statistics for the twenty principal towns of Egypt for 1901-10. Tables and diagrams. Fol. 1913. (The Department of Public Health.)

Germany—

Labour. Die Verbände der Arbeitgeber, Angestellten und Arbeiter im Jahre 1912. 8. Sonderheft zum Reichs-Arbeitsblatte. Fol. 1914. (Carl Heymanns Verlag.)

—— Die internationalen Beziehungen der deutschen Arbeitgeber-, Angestellten- und Arbeiterverbande. 9. Sonderheft zum Reichs-Arbeitsblatte. Fol. 1914. (*Id.*)

Deutsche Statistische Gesellschaft. Niederschrift der Verhandlungen der dritten Mitgliederversammlung vom 29. bis 30. Juni 1913 in Breslau. lvii + 40 pp., fol. 1914. (The Society.)

Verein für Sozialpolitik—

Bewegung der Weizenpreise und ihre Ursachen. Von *Louis Perlmann.* 8vo. 1914. (Purchased.)

Britisch-Kaffraria und seine deutschen Siedlungen. Von *Johannes Spanuth.* 8vo. 1914. (*Id.*)

Entwicklung der Landwirtschaft in den Vereinigten Staaten von Nordamerika und ihr Einfluss auf die Preisbildung Landwirtschaftlicher Erzeugnisse. Von *Dr. Max Augstin.* 8vo. 1914. (*Id.*)

Löhne und Lebenskosten in Westeuropa im 19. Jahrhundert (Frankreich, England, Spanien, Belgien). Nebst einem Anhang: Lebenskosten deutscher und westeuropaischer Arbeiter fruher und jetzt. Von *Dr. Carl von Thszka.* 8vo. 1914. (*Id.*).

Mexico—

Census, 1910. Division Territorial de los Estados Unidos Mexicanos. 2 parts. 8vo. Mexico, 1913. (The Director General of Statistics.)

(a) Foreign Countries—*Contd.*

Sweden—

Census, December 31, 1910. Part 1. Area and population. (In Swedish.) 8vo. 1914. (The Central Statistical Bureau.)

Municipal elections. Report on, in 1911 and 1912. (In Swedish.) 41 pp., 8vo. 1913. (*Id.*)

United States—

Agriculture, Department of. A drought-resisting adaptation in seedlings of Hopi Maize. By G. N. Collins. 10 pp., 8vo. 1914. (The Author.)

Census Bureau. Census 1910. Vol. 5. Agriculture, 1909 and 1910. General report and analysis. 4to. 1913. (The Bureau.)

Labour. Bulletin of Bureau of Labor Statistics. Whole Nos. 130 and 134. 8vo. 1913. (*Id.*)

Connecticut. Workmen's Compensation. Bulletin of preliminary information. 48 pp., 8vo. 1913. (The Bureau of Labor Statistics.)

Maine. 1st Biennial Report of Department of Labour and Industry, 1911-12. 8vo. 1913. (The Department.)

Boston. Bulletin No. 2 of Social Research Council of Boston . . . 8vo. (The Bureau of Statistics of Boston.)

California University. Publications in Economics—

Vol. 3, No. 1. Women in Trade Unions in San Francisco. By *Lillian R. Matthews.* 8vo. 1913. (The University.)

Vol. 3, No. 2. Financial history of California. Public revenues, debts and expenditures. By *William C. Fankhauser.* 8vo. 1913. (*Id.*)

Vol. 3, No. 3. Jurisdictional disputes resulting from structural differences in American trade unions. By *Solomon Blum.* 8vo. 1913. (*Id.*)

Columbia University Studies—

Vol. 56, No. 1. Speculation on the New York Stock Exchange. September, 1904–March, 1907. By *Algernon A. Osborne.* 8vo. 1913. (P. S. King and Son.)

Vol. 56, No. 2. The policy of the United States towards industrial monopoly. By *Oswald W. Knauth*, Ph.D. 8vo. 1914. (*Id.*)

Vol. 57, No. 1. The Civil Service of Great Britain. By *Robert Moses.* 8vo. 1914. (*Id.*)

(b) India and Colonies.

Canada—

Census, 1911. Bulletin 18, ages of the people. 34 pp., 8vo. 1914. (The Census and Statistics Office.)

(c) United Kingdom and its several Divisions.

United Kingdom—

Indian Finance and Currency. Final Report of the Royal Commission. [Cd-7236.] 1914. (Purchased.)

England and Wales—

Roads. (Greater London.) Report on Conference on arterial road communication in Greater London, held November 25, 1913. . . . 42 pp., 8vo. 1913. (Purchased.)

London County Council. Report of Council to March 31, 1913, prepared by the Clerk of the Council. 348 pp., 8vo. 1914. (The Clerk.)

Ireland—

Births, &c. Supplement to 47th Report of Registrar-General containing Decennial Summaries for 1901-10. [Cd-7121.] 1914. (Purchased.)

Scotland—

Fisheries. Report of Scottish Departmental Committee on North Sea Fishing Industry. Report, Part 1, with Appendices. [Cd-7221.] 1914. (Sir Harry Verney, M.P.)

(d) **Authors, &c.**

Adeane (*Charles*) and *Savill* (*Edwin*). The Land Retort. A study of land question with answer to Report of Secret Enquiry Committee. xx + 153 pp., sm. 8vo. London, 1914. (Mr. John Murray.)

Best (*R. H.*) and *Ogden* (*C. K.*). Problem of continuation school and its successful solution in Germany. A consecutive policy. xv + 80 pp., 8vo. London, 1914. (P. S. King and Son.)

Bisschop (*W. R.*). The Child as affected by the Law of Divorce. 11 pp., 8vo., 1914. (*Id.*)

Bruneau (*Louis*). L'Allemagne en France. Enquêtes économiques. xii + 343 pp., sm. 8vo. Paris, 1914. (Plon-Nourrit et Cie.)

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Castberg (*P. H.*). Production. A Study in Economics. xvi + 382 pp., 8vo. London, 1914. (G. Allen and Co.)

Dale (*Bernard*). The effect of taxes on food-stuffs. When and why a tax on food-stuffs does not increase the cost to the consumer. xv + 64 pp., 8vo. London, 1914. (Purchased.)

Dublin (*Louis I.*)—

The full-time Health officer and rural hygiene. 8 pp., 8vo. 1913. (The Author.)

Possibilities of reducing Mortality at higher age-groups. 10 pp., 8vo. 1913. (*Id.*)

Dublin (*Louis I.*) and *Kopf* (*Edwin W.*). Experiment in Compilation of Mortality Statistics. 9 pp., 8vo. 1913. (*Id.*)

Gray's Railway Traders' Compendium . . . 175 + 18 pp. 4to. Manchester, 1914. (Purchased.)

Guyot (*Yves*). L'Industrie et les Industriels. (Encyclopédie Scientifique.) xxviii + 356 pp., sm. 8vo. Paris, 1914. (O. Doin and Fils.)

Hythe (*Viscount*), D.C.L. Problems of Empire. The faith of a federalist. New edition. With a foreword by the Rt. Hon. Earl Grey, G.C.B., &c. xvi + 217 pp., 8vo. London, 1913. (The Author.)

Keeling (*Frederic*). Child labour in United Kingdom. A study of development and administration of the law relating to employment of children. xxxii + 326 pp., 8vo. London, 1914. (P. S. King and Son.)

Lennard (*Reginald*). Economic notes on English agricultural wages. ix + 154 pp., 8vo. London, 1914. (Macmillan and Co.)

Lescure (*Jean*). L'Epargne en France. viii + 114 pp., 8vo. Paris, 1914. (Larose and Tenin.)

Lordier (*Ch.*). Economie politique et statistique. xi + 604 pp., 8vo. Paris, 1914. (Purchased.)

Loria (*Achille*). Economic Synthesis. A study of laws of income. Translated from Italian by M. Eden Paul. ix + 368 pp., 8vo. London, 1914. (G. Allen and Co.)

Macaulay (*T. B.*). The supposed inferiority of first and second born members of families. Statistical fallacies. 17 + 4 pp., 8vo. Montreal [1912]. (The Author.)

Meyr (*Dr. Georg von*). Die Staatswissenschaften und ihr Standort im Universitätsunterricht . . . 27 pp., 4to. München, 1913. (*Id.*)

Mendelson (*Dr. M.*). Die Entwicklungsrichtungen der deutschen Volkswirtschaft . . . vi + 75 pp., 8vo. Leipzig, 1913. (A. Deichert'sche Verlagsbuchhandlung.)

Meuss (*Johann Friedrich*). Die Unternehmungen des Königlichen Seehandlungs-Instituts zur Emporbringung des preussischen Handels zur See. Ein Beitrag zur Geschichte der Seehandlung (Preussische Staatsbank) und des Seewesens in Preussen in der ersten Hälfte des neunzehnten Jahrhunderts. ix + 329 pp., 8vo. 1914. (Purchased.)

Musgrave (*Charles E.*). The London Chamber of Commerce from 1881 to 1914. A Retrospective Appreciation. viii + 93 pp., 8vo. 1914. (Effingham Wilson.)

Osborne (*R. S.*). Modern Business Routine explained and illustrated. Volume 1.—Home Trade. ix + 237 pp., 8vo. 1914. (*Id.*)

(d) **Authors, &c.**—*Contd.*

Phelps (*Edward Bunnell*), M.A.—
Automatic Sprinkler Protection for Factory Workers. 23 pp., 8vo. 1914. (The Author.)
Certain Phases and Fallacies of American Infant Mortality Statistics. 19 pp., 8vo. 1913. (*Id.*)
New Statute for Protection of Child-bearing Factory Workers and Means of making it Effective. 68 pp., 8vo., 1913. (*Id.*)

Price (*L. L.*), M.A. Co-operation and Co-partnership. 264 pp., sm. 8vo. London [1914]. (*Id.*)

Sakolski (*A. M.*). American railroad economics. A text-book for investors and students. xii + 295 pp., sm. 8vo. New York, 1913. (Macmillan and Co.)

Spalding (*William F.*). Foreign Banking appointments. . . . 28 pp., 8vo. London, 1913. (The Author.)

Virgilii (*F.*). Statistica. Sesta Edizione rifatta. (Manuali Hoepli Serie Scientifica 107.) xx + 228 pp., sm. 8vo. Milano, 1914. (Ulrico Hoepli.)

Williams (*R.*). First Year's Working of Liverpool Docks Scheme. (The Liverpool Economic and Statistical Society.) 8vo. 1913. (The Northern Publishing Co., Ltd.)

(e) **Societies, &c. (British), and Miscellaneous.**

Agricultural Organization Society. Agricultural Co-operation in England and Wales. Statistics of Agricultural Co-operative Societies, 1912. 58 pp., 8vo. London, 1913. (The Society.)

Infant Mortality. Report of proceedings of English-speaking Conference on Infant Mortality, August 4 and 5, 1913. 456 pp., 8vo. London, 1913. (Purchased.)

Land Problem, The. Notes suggested by Report of Land Enquiry Committee. 35 pp., 8vo. London, 1914. (*Id.*)

London Library. Catalogue of the London Library. Vol. 1. A–K; vol. 2. L–Z. 2 vols, 4to. 1913. (The Library.)

The Political Quarterly. Number 1. February, 1914. 8vo. 1914. (The Editor.)

Russian Year-Book for 1914. Compiled and edited by H. P. Kennard, M.D., assisted by Netta Peacock. 8vo. London, 1914. (Eyre and Spottiswoode, Ltd.)

PERIODICAL RETURNS.

REGISTRATION OF THE UNITED KINGDOM.

No. I.—ENGLAND AND WALES.

MARRIAGES—To 30th September, 1913.
BIRTHS and DEATHS—To 31st December, 1913.

A.—*Serial Table of* Marriages, Births, *and* Deaths, *returned in the Years* 1913-1907, *and in the* Quarters *of those Years.*

Calendar Years, 1913-1907:—*Numbers.*

Years	1913.	'12.	'11.	'10.	'09.	'08.	'07.
Marriages No.	286,292	283,195	274,943	267,721	260,544	264,940	276,421
Births .... ,,	881,480	872,767	881,138	896,962	914,472	940,383	918,042
Deaths .... ,,	505,026	486,967	527,810	483,247	518,003	520,456	524,221

Quarters *of each Calendar Year,* 1913-1907.

(I.) Marriages:—*Numbers.*

Qrs. ended last day of	1913.	'12.	'11.	'10.	'09.	'08.	'07.
March........ No.	60,964	44,661	44,808	56,432	45,094	47,548	53,017
June .... ,,	65,792	74,365	75,656	61,036	71,829	73,502	69,782
September ,,	83,582	83,387	77,873	76,545	73,843	73,785	79,129
December ,,	75,954	80,782	76,606	73,708	69,778	70,105	74,493

(II.) Births:—*Numbers.*

Qrs. ended last day of	1913.	'12.	'11.	'10.	'09.	'08.	'07.
March........ No.	216,540	222,599	223,585	221,684	228,787	240,112	229,287
June .... ,,	227,374	218,096	225,774	234,825	237,220	243,834	238,535
September ,,	225,431	219,255	222,506	227,146	228,840	237,229	230,528
December ,,	212,135	212,817	209,273	213,307	219,625	219,208	219,692

(III.) Deaths:—*Numbers.*

Qrs. ended last day of	1913.	'12.	'11.	'10.	'09.	'08.	'07.
March........ No.	146,556	144,652	143,128	136,400	160,506	156,328	160,020
June .... ,,	121,754	115,794	119,966	115,671	125,233	121,052	127,337
September ,,	113,455	101,679	140,949	104,149	104,786	113,929	106,813
December ,,	123,261	124,842	123,767	127,027	127,478	129,147	130,051

Annual Rates of MARRIAGES, BIRTHS, *and* DEATHS, *per* 1,000 PERSONS LIVING *in the Years* 1913-1907, *and in the* QUARTERS *of those Years.*

Calendar YEARS, 1913-1907:—*General Ratios.*

YEARS	1913.	Mean 1903-'12.	1912.	'11.	'10.	'09.	'08.	'07.
Estmtd. Popln. of England and Wales *in thousands* in middle of each Year*	36,919,	—	36,540,	36,164,	35,792,	35,424,	35,059,	34,699,
Persons Married	15·5	15·3	15·5	15·2	15·0	14·7	15·1	15·9
Births	23·9	26·3	23·8	24·4	25·1	25·8	26·7	26·5
Deaths	13·7	14·9	13·3	14·6	13·5	14·6	14·8	15·1

QUARTERS *of each Calendar Year*, 1913-1907.

(I.) PERSONS MARRIED:—*Ratio per* 1,000.

Qrs. ended last day of	1913	Mean 1903-'12	1912.	'11.	'10.	'09.	'08.	'07.
March	13·4	11·0	9·8	10·0	12·8	10·3	10·9	12·4
June	14·3	16·5	16·3	16·8	13·7	16·3	16·8	16·1
September	18·0	17·2	18·1	17·1	17·0	16·5	16·7	18·1
December	16·3	16·6	17·5	16·8	16·3	15·6	15·9	17·0

(II.) BIRTHS:—*Ratio per* 1,000.

Qrs. ended last day of	1913.	Mean 1903-'12.	1912.	'11.	'10.	'09.	'08.	'07.
March	23·8	26·9	24·4	25·1	25·1	26·2	27·5	26·8
June	24·7	27·1	23·9	25·0	26·3	26·9	27·9	27·6
September	24·2	26·4	23·8	24·4	25·2	25·6	26·8	26·4
December	22·8	25·0	23·1	23·0	23·6	24·6	24·8	25·1

(III.) DEATHS:—*Ratio per* 1,000.

Qrs. ended last day of	1913.	Mean 1903-'12.	1912.	'11.	'10.	'09.	'08.	'07.
March	16·1	17·2	15·9	16·1	15·5	18·4	17·9	18·7
June	13·2	14·1	12·7	13·3	13·0	14·2	13·8	14·7
September	12·2	13·4	11·0	15·5	11·5	11·7	12·9	12·2
December	13·2	14·8	13·6	13·6	14·1	14·3	14·6	14·9

* Based on the results of the Censuses of 1901 and 1911.

B.—*Special Town Table :*—POPULATION ; BIRTH-RATE *and* DEATH-RATE *in each Quarter of* 1913, *in the* NINETY-SIX *Large Towns.*

Cities and boroughs.	Estimated population in the middle of the year 1913.	Annual Rate to 1,000 Living during the thirteen weeks ending							
		29th March, 1913. (1st quarter.)		28th June, 1913. (2nd quarter.)		27th Sept., 1913. (3rd quarter.)		3rd Jan., 1914. (4th quarter.)	
		Births.	Deaths.	Births.	Deaths.	Births.	Deaths.	Births.	Deaths.
Ninety-six towns	17,852,766	25·4	16·9	25·9	13·5	25·3	12·7	24·1	14·2
Including—									
London	4,518,191	25·7	17·5	25·2	13·3	24·7	11·8	23·7	14·1
West Ham	294,223	32·0	16·9	32·6	12·4	29·2	13·9	30·3	14·8
Croydon	178,094	20·6	13·5	22·6	10·8	23·1	10·7	21·4	11·4
Brighton	133,096	19·4	15·1	18·6	14·6	18·5	10·8	16·8	13·6
Portsmouth	241,256	25·5	15·1	24·2	11·0	24·4	10·5	23·7	12·3
Plymouth	113,083	24·2	19·1	23·1	14·0	22·8	14·6	23·8	14·7
Bristol	361,362	21·9	15·5	22·9	12·2	23·3	11·1	21·9	11·9
Cardiff	186,554	25·3	14·5	26·2	12·7	26·5	12·6	25·7	13·7
Swansea...............	119,485	28·5	15·6	28·8	12·4	27·2	13·6	27·5	15·6
Wolverhampton	95,601	26·9	18·5	27·7	16·3	26·3	15·2	25·1	12·8
Birmingham	859,644	27·1	16·6	29·1	13·3	26·8	14·1	26·4	14·8
Norwich	123,288	23·2	14·1	23·4	13·1	20·8	12·6	20·8	15·6
Leicester	230,970	22·4	15·2	23 8	12·8	22·0	11·4	22·3	13·9
Nottingham	264,735	22·7	16·2	23·9	13·8	21·8	12·2	22·4	14·4
Derby	125,462	24·0	15·5	25·4	13·1	23·4	10·0	21·8	11·5
Birkenhead	135,557	27·9	16·3	30·3	13·0	29·5	15·5	28·2	13·0
Liverpool	756,553	30·6	20·5	30·3	16·6	30·3	16·7	29·0	18·0
Bolton	183,879	23·3	18·0	21·6	15·4	22·2	14·4	19·5	15·0
Manchester	730,976	25·8	17·7	26·5	14·7	26·9	14·6	24·7	15·3
Salford	233,819	26·2	16·3	27·7	15·9	27·7	14·6	25·1	16·3
Oldham	149,936	24·6	18·4	24·6	16·1	22·5	14·7	21·2	18·1
Burnley................	109,021	22·6	18·4	23·0	14·5	23·7	14·3	22·5	18·7
Blackburn...........	133,971	21·8	18·1	23·1	15·2	22·0	13·3	20·4	15·7
Preston	118,070	23·4	21·7	26·4	16·9	24·5	14·0	21·4	15·4
Huddersfield	110,882	19·5	16·1	21·1	14·5	18·8	13·9	18·6	13·4
Halifax	100,740	18·3	17·6	19·2	15·4	18·9	12·9	18·8	15·7
Bradford	290,540	19·6	15·5	20·2	14·5	20·5	14·3	18·4	15·4
Leeds....................	457,295	23·6	17·9	23·5	15·4	24·1	14·5	23·0	13·9
Sheffield	471,662	27·7	18·2	28·5	14·4	29·0	14·4	27·6	16·0
Hull	287,032	27·9	15·4	28·5	12·9	28·6	15·5	27·1	15·3
Sunderland	152,377	30·8	20·2	32·2	17·6	32·4	15·7	28·6	17·5
Gateshead............	118,601	30·1	17·5	31·8	13·8	28·8	13·2	26·3	13·3
Newcastle-on-Tyne	271,295	27·4	18·5	28·5	14·1	27·5	13·2	25·2	14·5

Note.—The 96 great towns are those with populations exceeding 50,000 persons at the Census of 1911. The birth-rate is based upon births actually registered in the several towns. The death-rate in London has been corrected as far as possible (1) by excluding deaths of all non-residents, and (2) by including the deaths of London residents occurring in the Metropolitan outer ring or in Metropolitan public institutions situated outside the County. (See also Table XIV.) The death-rates in the other towns have been corrected, as far as possible (1) by the exclusion of all deaths of non-residents, and (2) by the inclusion of deaths of residents in certain outlying public institutions. With regard to the outer ring and its constituent areas, however, correction is more complete, a distribution of all transferable deaths occurring in any part of Greater London having been made.

C.—*Comparative Table of* CONSOLS, PROVISIONS, COAL, *and* PAUPERISM *in each* QUARTER *of* 1911-12-13.

Cols...	1			2	3		4			5			6		7	8
	Average prices of														PAUPERISM.	
Quarter ended	2½*l.* per cent. CONSOLS (for money) per 100*l.* Stock.*			Average minimum rate per cent. of DISCOUNT charged by the Bank of England.*	WHEAT per quarter.†		Price per pound at the Metropolitan Cattle Market (sinking the offal) ‡						Average price of seaborne COAL per ton in the London market §		Average number of PAUPERS relieved on the *last day* of each week.	
							Beef.			Mutton.						
							Inferior quality.	Second quality.	First quality.	Inferior quality.	Second quality.	First Quality.			In-door.	Out-do
1911	£	*s.*	*d.*	£	*s.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*s.*	*d.*		
Mar. 31	80	7	1	3·77	30	4	3⅝	5⅞	7	5½	7¾	9	16	5	284.333	402,2
June 30	80	19	3	3·00	31	5	4½	6½	7⅜	4¼	7⅛	8½	15	9	264.262	382,8
Sept. 30	78	1	8	3·13	31	11	3⅝	6⅛	7¼	4⅝	6⅝	7⅞	16	3	254,632	380,1
Dec. 31	77	18	4	4·00	32	11	3⅞	6⅜	7⅞	5	6½	8¼	19	9	270.447	387,0
1912																
Mar. 31	77	16	4	3·71	33	10	4¼	7	8⅛	5⅞	8⅜	9⅜	21	10	282.258	411,
June 30	77	11	2	3·21	37	0	5½	7½	8½	5¼	7¼	9½	21	5	263.866	408,9
Sept. 30	74	16	11	3·36	36	4	5⅛	7⅜	8⅝	5¾	7¼	9⅛	19	10	253.617	386,
Dec. 31	74	6	8	4·83	31	10	4¼	6½	7⅞	5½	6¾	9¼	21	0	266,753	385,1
1913																
Mar. 31	74	10	2	5·00	30	10	5⅛	6½	8	6⅜	8⅝	10⅜	21	0	274.467	388,
June 30	74	5	6	4·59	32	3	5	7	8⅛	5⅞	7⅞	9¼			255,001	371,
Sept. 30	73	6	11	4·50	32	10	4½	7	8	6	7¼	9⅛	21	0	214.358	364,
Dec. 31	72	9	2	4·99	30	8	4½	6⅞	8	6¼	8⅜	10⅛	21	0	255.791	366,7

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* The prices of Consols and the Rate of Discount are furnished by the Chief Cashier of Bank of England.

† As published by the Board of Agriculture.

‡ Furnished by the Board of Agriculture.

§ Furnished by the Mining Statistics Branch of the Home Office. The prices relate Sunderland coal only.

‖ No quotations during the quarter.

No. II.—SCOTLAND.

BIRTHS, DEATHS, AND MARRIAGES, IN THE YEAR ENDED 31ST DECEMBER, 1913.

I.—*Serial Table :—Number of* BIRTHS, DEATHS, *and* MARRIAGES *in Scotland, and their Proportion to the Population estimated to the Middle of each Year, during each Quarter of the Years* **1913-1909** *inclusive.*

	1913.		1912.		1911.		1910.		1909.	
	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.
1st Quarter—										
Births	29,838	25·6	30,272	25·6	30,710	26·1	30,422	26·1	32,373	27·9
Deaths	21,270	18·2	20,671	17·5	19,843	16·9	20,605	17·7	21,469	18·5
Marriages ..	7,844	6·7	6,994	5·9	6,758	5·8	7,317	6·3	7,111	6·1
2nd Quarter—										
Births	32,211	27·3	32,221	27·3	32,935	27·7	33,812	28·6	34,671	29·6
Deaths	18,147	15·4	17,728	15·0	18,027	15·2	18,593	15·8	18,478	15·8
Marriages ..	8,503	7·2	8,209	7·0	8,567	7·2	7,928	6·7	8,171	7·0
3rd Quarter—										
Births	29,489	24·7	30,166	25·3	29,653	24·7	30,061	25·2	31,186	26·3
Deaths	16,192	13·6	15,219	12·8	16,138	13·4	15,331	12·8	14,964	12·6
Marriages ..	9,028	7·6	8,778	7·4	8,434	7·0	7,975	6·7	7,777	6·6
4th Quarter—										
Births	29,011	24·3	30,057	25·2	28,513	23·7	29,705	24·9	30,352	25·6
Deaths	17,464	14·6	18,719	15·7	17,718	14·8	17,716	14·8	19,683	16·6
Marriages ..	8,314	7·0	8,529	7·1	8,052	6·7	7,646	6·4	7,033	5·9
Year—										
Population .	4,728,132		4,741,077		4,749,673		4,737,268		4,707,858	
Births	120,549	25·5	122,716	25·9	121,811	25·6	124,000	26·2	128,582	27·3
Deaths	73,073	15·5	72,337	15·3	71,726	15·1	72,245	15·3	74,594	15·8
Marriages ..	33,689	7·1	32,510	6·9	31,811	6·7	30,866	6·5	30,092	6·4

II.—*Special Average Table:—Number of Births, Deaths, and Marriages in Scotland and in the divisions of the counties during each Quarter of* **1913**, *and their proportion to the population.*

Registration group of districts.	Total Births.		Deaths.		Marriages.	
	Number.	Per 1,000 of population.	Number.	Per 1,000 of population	Number.	Per 1,000 of population.
1*st Quarter*—SCOTLAND	29,838	25·6	21,270	18·2	7,844	6·7
Northern division ...	451	18·0	499	19·9	137	5·5
North Western div....	760	19·5	725	18·6	209	5·4
North Eastern div.	2,758	24·6	2,092	18·6	568	5·1
East Midland div.	4,141	23·8	3,097	17·8	1,056	6·1
West Midland div.	2,471	25·9	1.676	17·6	518	5·4
South Western div....	14,332	28·4	9,438	18·7	4,011	8·0
South Eastern div.	3,989	23·2	2.920	17·0	1,094	6·4
Southern div.	936	20·7	823	18·2	251	5·5
2*nd Quarter*—SCOTLAND	32,211	27·3	18,147	15·4	8,503	7·2
Northern division ...	500	19·8	412	16·3	85	3·4
North Western div. ..	699	17·7	672	17·0	132	3·3
North Eastern div. ...	2,876	25·3	1,810	15·9	814	7·2
East Midland div. ...	4.391	25·0	2.694	15·3	1.176	6·7
West Midland div. ...	2.593	26·9	1.362	14·1	523	5·4
South Western div...	15.805	31·0	7,976	15·7	4,061	8·0
South Eastern div. ...	4,332	24·9	2.489	14·3	1.379	7·9
Southern div.	1,015	22·2	732	16·0	333	7·3
3*rd Quarter*—SCOTLAND	29.489	24·7	16,192	13·6	9,028	7·6
Northern division	475	18·6	393	15·4	111	4·3
North Western div. ..	822	20·6	546	13·7	129	3·2
North Eastern div. ...	2.651	23·1	1,481	12·9	709	6·2
East Midland div. ...	3.931	22·1	2.388	13·4	1,184	6·7
West Midland div. ...	2,402	24·6	1.250	12·9	553	5·7
South Western div.....	14.279	27·7	7.336	14·2	4.648	9·0
South Eastern div.	3.935	22·4	2,191	12·5	1,442	8·2
Southern div.	994	21·5	607	13·1	252	5·4
4*th Quarter*—SCOTLAND	29,011	24·3	17,464	14·6	8,314	7·0
Northern division ...	510	19·9	390	15·2	143	5·6
North Western div.	792	19·9	587	14·7	221	5·5
North Eastern div. ...	2,751	24·0	1,671	14·6	943	8·2
East Midland div.	3,960	22·3	2.513	14·2	1,145	6·4
West Midland div.	2,375	24·4	1,265	13·0	503	5·2
South Western div.	14,087	27·3	7.954	15·4	3,821	7·4
South Eastern div. ...	3,721	21·2	2,362	13 5	1,235	7·0
Southern div.	815	17.6	722	15·6	303	6·5

Population of Scotland.

Population.	Scotland.	Northern division.	North Western division.	North Eastern division.	East Midland division.	West Midland division.	South Western division.	South Eastern division.	Southern division.
By Census of 1911	4,760,904	105,997	164,636	467,333	712,146	356,312	2,033,521	700,577	190,352
Estimated to middle of 1913	4,733,700	101,600	158,300	455,700	705,000	357,000	2,045,400	697,000	183,700

No. III.—IRELAND.

IRELAND.—*Number of Births, Deaths and Marriages in each Province for each Quarter of* 1913 *and their Proportion to the Population.*

Provinces.	Births.		Deaths.		Marriages.*	
	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.
1st quarter—						
Leinster	6,918	23·8	6,101	21·0	1,524	5·2
Munster	5,768	22·3	4,838	18·7	991	3·8
Ulster	9,359	23·7	8,495	21·5	2,334	5·9
Connaught	3,549	23·2	2,415	15·8	520	3·4
Ireland	25,594	23·4	21,849	19·9	5,369	4·9
2nd quarter—						
Leinster	7,247	24·9	5,680	19·6	1,163	4·0
Munster	5,992	23·1	4,596	17·8	1,716	6·6
Ulster	9,961	25·2	7,312	18·5	1,983	5·0
Connaught	3,415	22·4	2,401	15·7	833	5·5
Ireland	26,615	24·3	19,989	18·3	5,695	5·2
3rd quarter—						
Leinster	6,714	23·1	4,757	16·4	1,876	6·5
Munster	5,679	21·9	3,693	14·3	1,164	4·5
Ulster	9,101	23·0	6,023	15·2	2,015	5·1
Connaught	3,215	21·0	1,923	12·6	554	3·6
Ireland	24,709	22·6	16,396	15·0	5,609	5·1
4th quarter—						
Leinster	6,224	21·4	4,828	16·6	1,660	5·7
Munster	5,411	21·0	3,713	14·3	1,059	4·1
Ulster	8,492	21·5	6,075	15·4	2,220	5·6
Connaught	3,157	20·7	1,863	12·2	453	3·0
Ireland	23,314	21·3	16,479	15·1	5,392	4·9
Total	100,232	22·9	74,713	17·1	—	—

* For the preceding quarter.

Population of Ireland.

	Leinster.	Munster.	Ulster.	Connaught.	Ireland.
By census of 1911	1,162,044	1,035,495	1,581,696	610,984	4,390,219
Estimated to middle of 1913	—	—	—	—	4,379,076

IRELAND.

	Births.		Deaths.		Marriages.*	
	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.
1st quarter, 1913—						
Total rural districts	15,862	21·4	14,032	18·9	—	
Total urban districts	9,732	27·4	7,817	22·0	—	
Dublin co. borough	2,481	—	1,911	—	541	
Belfast co. borough	2,780	—	2,215	—	818	
2nd quarter—						
Total rural districts	16,520	22·3	13,170	17·8	—	
Total urban districts	10,095	28·4	6,819	19·2	—	
Dublin co. borough	2,590	—	1,819	—	340	
Belfast co. borough	—	—	—	—	656	
3rd quarter—						
Total rural districts	15,318	20·6	10,024	13·5	—	
Total urban districts	9,391	26·4	6,372	17·9	—	
Dublin co. borough	2,364	—	1,628	—	741	
Belfast co. borough	2,795	—	1,770	—	651	
4th quarter—						
Total rural districts	14,684	19·8	10,399	14·0	—	
Total urban districts	8,630	24·3	6,080	17·1	—	
Dublin co. borough	2,200	—	1,689	—	640	
Belfast co. borough	2,471	—	1,617	—	787	

* For the preceding quarter.

No. IV.—GREAT BRITAIN AND IRELAND.

SUMMARY *of* MARRIAGES, *in the Year ended* 30*th September*, 1913; *and of* BIRTHS *and* DEATHS, *in the Year ended* 31*st December*, 1913.

(Compiled from the Quarterly Returns of the respective Registrars-General.)

Countries.	[000's omitted.] Area in statute acres.	Population middle 1913, estimated.	Marriages.	Per 1,000 of population.	Births.	Per 1,000 of population.	Deaths.	Per 1,000 of population.
		No.	No.	Ratio.	No.	Ratio.	No.	Ratio.
England and Wales	37,338,	36,919,	291,120	7·88	881,480	23·87	505,026	13·68
Scotland	19,070,	4,728,	33,904	7·17	120,549	25·49	73,073	15·45
Ireland	20,345,	4,379,	22,069	5·03	100,232	22·88	74,713	17·06
Great Britain and Ireland	76,753,	46,026,	347,093	7·54	1,102,261	23·94	652,812	14·18

Vol. LXXVII.] [Part V.

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The SIZES *of* BUSINESSES, MAINLY *in the* TEXTILE INDUSTRIES.

By Professor S. J. CHAPMAN and T. S. ASHTON.[1]

[Read before the Royal Statistical Society, March 17, 1914, the President, Professor F. Y. EDGEWORTH, M.A., F.B.A., in the Chair.]

INTRODUCTION.

THE object of this inquiry is to make a realistic study, mainly with regard to the textile industries, of the economic units which may be termed "businesses" or "firms." Our prime purpose is, in the first place, to discover whether a typical size belongs to each class of industrial unit, and, if so, whether there is a regular distribution of business magnitudes about the type, and, in the second place, to explain any uniformity disclosed. Incidentally, moreover, we shall aim in some cases at describing and accounting for the diverse natures of businesses or firms. In a word, our work is a tentative realistic research in industrial morphology.

Our material has been obtained from the following directories:—

Messrs. Worrall's[2]:	*Cotton Spinners' and Manufacturers' Directory for Lancashire* (1911).
,,	*Cotton Spinners' and Manufacturers' Directory for Lancashire* (1884).
,,	*Continental Directory of Cotton Spinners and Manufacturers* (1912-13).
,,	*Yorkshire Textile Directory* (1912-13).
,,	*Textile Directory of Ireland, Scotland and Wales* (1912).

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[1] MR. LEONARD F. BEHRENS was associated with us at the beginning of our work for several months. The labour involved in the preparation of the section on weaving in Lancashire largely fell upon him. We desire to express here our obligations for his valuable collaboration.

[2] We desire to express our obligations to Messrs. Worrall for material in their offices placed at our disposal and their readily accorded assistance on points of interpretation.

Messrs. W. H. Gribbin and Co.: *Indian and Japanese Textile Directory* (1913).

Davison Publishing Co.: "*The Blue Book*" *Textile Directory of the United States and Canada* (1912-13).

Messrs. Rylands': *Colliery, Iron, Steel, &c., Directory* (1912).

Before our statistical material is presented some preliminary discussion of points involved in its interpretation is called for. First, we must explain what is meant by a "business" or "firm." By a "business" or "firm" we do not necessarily mean the productive group which is confined within, and completely fills, one factory or mill, but, broadly, any productive group or groups functioning under one direction in a district which may be more or less limited. Thus, a single employer may have two factories in the same district: when he has, we say, for the purposes of this paper, not that there are two businesses, but that there is one business only. Again, a single weaving-shed may be let off in three sections, say, to three independent employers: when this happens we count the factory as three businesses and not as one business. But it must not be imagined that "business" as thus roughly defined always stands out as unmistakably one and individual. A business may be, and generally is, a group made up of sub-groups controlled through foremen, overseers or managers, some of which sub-groups may be largely self-contained; and the seemingly individual business may itself be merged as a kind of sub-group in a larger group. Thus a number of "individual" firms are merged to some extent in the combination known as the "Fine Spinners' Association," and in the United States there are such combination businesses as the immense "American Woollen Corporation," the "American Thread Corporation," the "International Cotton Mills Corporation" and others. Again, if one company owns two mills, in a sense there is one business only whether the mills are in different districts or not, but in a sense each mill, with its manager, has an individuality which is likely to be greatest when the mills are in different towns and least when they stand next to one another. So our conception of the "business" or "firm" as something distinctively individual and measurable must be to some extent artificial.

This conception of the "firm" whether appropriate or not—and we submit that it is not inappropriate—has been forced upon us by the character and arrangement of many of the statistics to be used. Thus, the numbers of looms or spindles in buildings which form parts only of one productive enterprise are not always recorded in these statistics: and it is not usually possible, without the expenditure of far more labour than the results would justify, to obtain from them the number of spindles or looms owned by a single productive enterprise in different districts, since the figures for the chief countries are grouped by districts. So, partly on scientific grounds and partly by reason of the constraint of circumstances, we must mean by the business or firm the productive group or groups under one control (apart from the control of a combination which has not completely destroyed the individuality of its members) within a district which may be more or less limited, whether or not it occupies one building only, and whether or not it exclusively occupies its buildings. The concern which lies in more than one district (when our statistics are grouped by districts, as they usually are) is cut into as many parts in our results as there are districts occupied by it. This fact prevents the numbers of large businesses from being as great as they would be otherwise; but it is to be remarked that the business with more than one mill or factory usually happens to be confined to one district, so that the district arrangement of figures cannot appreciably influence our aggregate results, except in the case of the very large firms. Thus, in the Lancashire cotton industry we found only 61 concerns, out of 1,791, which had mills or weaving-sheds in more than one district; and of these only 7 (all engaged in both spinning and "manufacturing," as weaving is termed) had industrial businesses in more than two districts, while none had a place in more than three. Of the 61 firms, 6 were spinning only, 24 were manufacturing only, and 31 were engaged in both operations. The figures obtained from the Directory relate to 657 firms spinning only, 855 weaving only and 279 combined. We are obviously justified then in concluding, as regards the Lancashire cotton industry at any rate—and similar evidence could be furnished relating to other data—that even if a wider definition were given to the term "business," the error in our presentment of the facts would be negligible in the case of spinning, and by no means grave enough to vitiate our general conclusions in other cases. It should be added that the degree of error would certainly be less in the case of Europe and the East than in the case of Lancashire, though probably larger in the case of the United States.

PART I.—THE COTTON INDUSTRY.

The outstanding processes in the cotton industry are (*a*) cleaning and carding, (*b*) spinning, (*c*) doubling, or twisting yarns together, (*d*) manufacturing (as weaving is technically termed), and (*e*) bleaching, dyeing and finishing. The first process is invariably united in the same business as the second; and the third process is frequently combined with them. The last processes grouped together in class (*e*), apart from a certain amount of dyeing of yarns, are independently organised almost without exception in this country, but in some places abroad their union with other processes is more common. These processes marked (*e*) will not be dealt with in the present paper, because the sizes of the businesses, or sections of businesses, engaged in them is not indicated in the available statistics. Spinning and manufacturing are sometimes united and sometimes disunited. The extent to which their union is found is dealt with on pages 491–3. We shall be concerned exclusively here with the magnitudes of spinning businesses and manufacturing businesses, and with quantitative relations as regards the union of the two when they are united.

Section A.—*Cotton Spinning.*

We shall now proceed to consider the magnitude of firms in and about Lancashire[3] which spin only, doubling being included in spinning. We have a measure of magnitude in the number of spindles. It is not a perfect measure, since spindles may be ring or mule or doubling spindles but it serves for rough purposes. It was not possible to take the classes of spindles separately and reckon each class on the basis of its capital value, as distinctions between them are not always recorded in the directories. In Table I (in the Appendix), which relates to all spinning firms furnishing particulars, the numbers of firms with different numbers of spindles (doubling spindles being added in) are set forth for various districts. In all 639 firms out of about 660 furnished particulars in 1884 and 657 out of about 690 in 1911; so the figures in the table are quite sufficiently exhaustive to be taken as typical.

The number of particularising firms of each size in 1911 is shown by the thick unbroken line in Fig. 1. This is based on units of 10,000 spindles. A smaller unit yielded numbers insufficient to generalise from. It may be observed, however, that there are about equal numbers of firms of 0–2,500, 2,500–5,000, 5,000–7,500 and 7,500–10,000 spindles (see Table I). Taking the thick graph in Fig. 1, some general law governing the dispersion of firms of different dimensions which actually works

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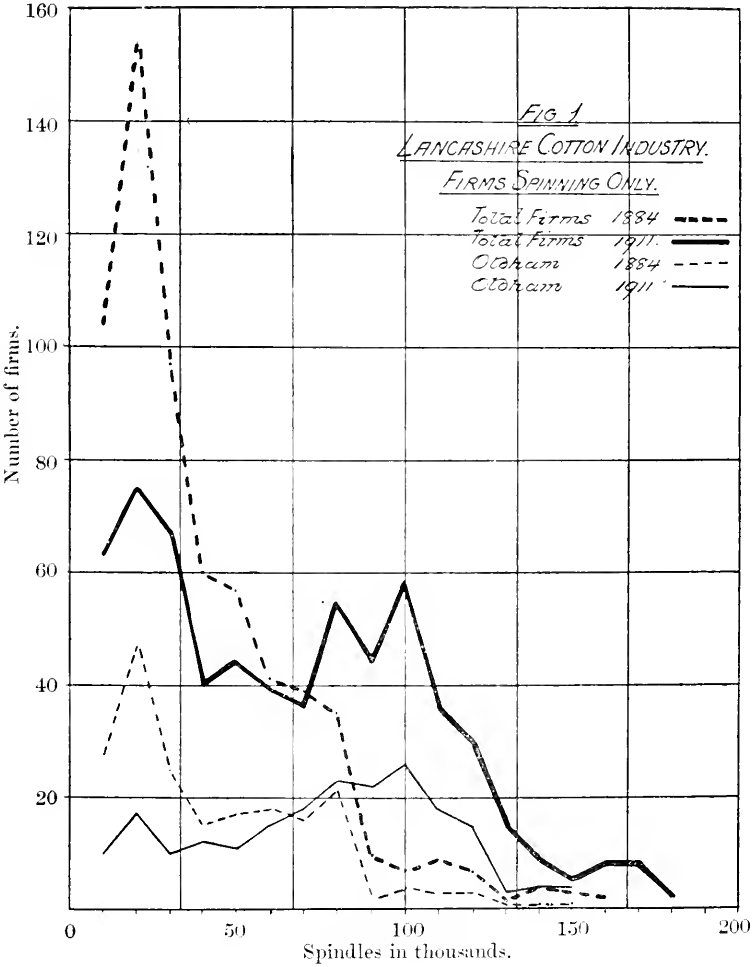
[3] Hereafter, when Lancashire is mentioned, the Lancashire district will be intended, which includes, for instance, Stockport, Hyde, Dukinfield, Stalybridge and Glossop, which are not actually in Lancashire.



out in practice, is at least suggested. Two outstanding maxima appear, one at 10,000 to 20,000 spindles and another (a forked one) at 70,000 to 100,000, and a regularity of dispersion about each is observable though it may be lop-sided. Looking at the graph one would suspect that it might relate to two broadly distinguishable classes of things, and this suspicion is borne out by what is known of business specialisation and diversity of industrial organisation within the industry. The size of a business is determined to some extent by the character of its output and type of its management. As regards the latter a few words now be said.

The varieties of industrial management are many, if small differences are taken into account, but they may be regarded as grouped around three leading types: (1) the business controlled by a single employer or partners; (2) the joint-stock company into which a business of the first type has been transformed; and (3) the business which has been floated as a joint-stock company with a number of shareholders. In what follows the third type will be marked "J" (= joint-stock in origin), the second "C" (= company other than J), and the first "P" (= private or partnership). The distinction between C and J—between the company which takes over a going concern and reaps profit out of an existing goodwill, on the one hand, and, on the other hand, the business which is initiated as a company with an elected board of directors—is fundamental; but from the information given in the sources of our material, it is not possible to divide the C's from the J's without making many mistakes. In attempting the division in the British Isles we have always classed a "limited" without the name of any person attached to it as J. Thus "Hill-Top "Mills Co., Ltd.," would be J, but "John Doe and Co., Ltd.," would be C. It might happen, of course, though it would not usually happen, that the former business had started as a private business, the owner or partners trading under the name of "Hill-Top Mills Co." Similarly our figures do not allow us to separate P from C accurately. "John Doe and Co., Ltd.," which we should call C, might be P, the business being in effect a private concern clothed for convenience in the limited liability form. We shall not build on the distinctions between P and C and between C and J; and, as we are not likely to have included under J a relatively important number of firms which are really C, our J group may be regarded as typical. Moreover, an error as regards the numbers of J does not much matter when we are comparing the percentages of J in different branches of the industry, since the percentage error would probably tend to be about the same in all branches. For similar reasons our P class is likely to serve our purposes satisfactorily enough. Later we shall have to try to account for the scope of each of these types of management.

In Table I the figures are arranged by districts, but the only district which is large enough to make generalisation at all possible is Oldham. The thin unbroken line in Fig. 1 shows the facts for Oldham in 1911. The 10–20 and 70–100 thousand maxima discovered in the case of Lancashire as a whole stand out again, but the larger maximum is the dominating one at Oldham, as it is not in Lancashire. The reason is the prevalence of coarse spinning and joint-stock organisation at Oldham. One striking thing is the almost exact repeat of the Lancashire graphs, in the corresponding Oldham graphs, as regards direction of each part.

It remains to consider the extent to which the dimensions of a business depend upon the form of its management. Table I shows the size dispersion of different types of firms in 1911 and 1884; and in addition (for those who find it worth while to go into geographical detail) the same for the chief places in 1911. Size dispersion in 1911 among P (private and partnership) businesses is indicated by the thin unbroken line in Fig. 2 and among J (joint-stock in origin) businesses by the thick unbroken line. The size dispersion of P is a simple one with maximum at 0–10 thousand, or probably, to take a smaller unit, at 0–2·5 thousand, as Table I (in the Appendix) shows. That of J has a marked 70–100 thousand

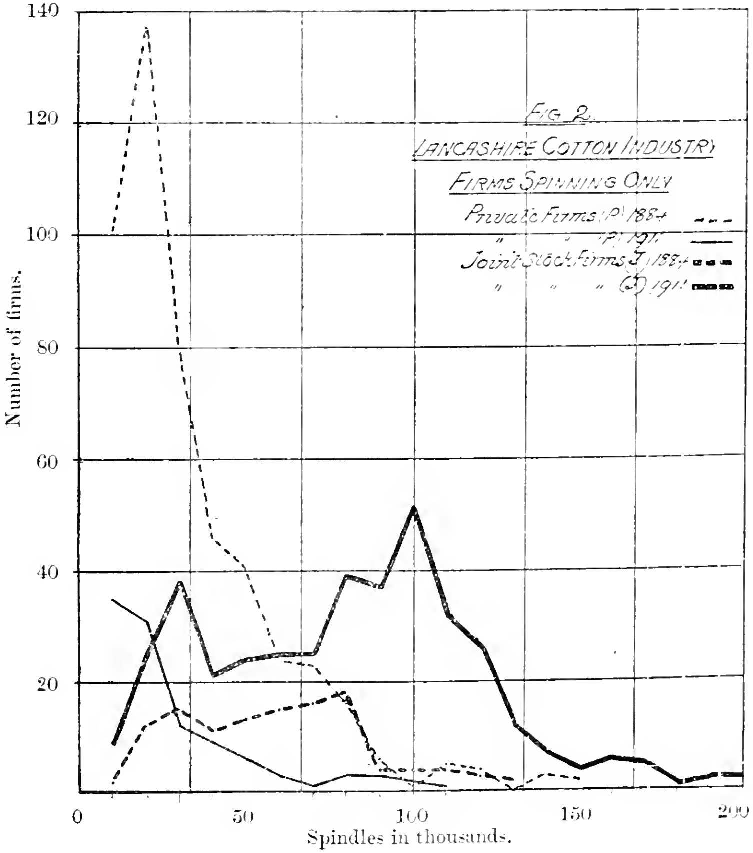


FIG. 2.

maximum, but combined with it a less pronounced 20–30 thousand maximum.

It is evident that it is J firms which largely account for the 70–100 thousand peak in the thick graph in Fig. 1. Also the remarkable similarity between the graph for Oldham (in Fig. 1) and that for all J firms in and about Lancashire will at once strike the inquirer. Doubtless the reason is that Oldham is peculiarly the home of joint-stock enterprise, partly for the reason that the type of work done in bulk is peculiarly suited to this kind of organisation. The character of business management is largely governed by the nature of the work done. No fewer than 78 per cent. of the spinning firms in Oldham are of the joint-stock form in origin (see Table II in Appendix). Those of such a form tend to be much larger than other concerns. The explanation is not far to seek. The kind of work which can be economically organised on a very large scale is likely to be just that kind of work for which joint-stock organisation will prove efficient. It is the kind of work which does not entail constant variation in the nature of the output and constant effort to keep orders in correspondence with the firm's productive capacity, or necessitate for other reasons unremitting supervision of detail. For the complex task of management involved when production is of this intricate and variable kind, the private employer, or the group of partners, is likely to prove most efficient. The organisation with a board of directors and salaried manager is more suited to a stereotyped kind of production which goes on continually turning out semi-gradable articles, especially when the unit of purchase of the latter tends to be large. Naturally the second sort of business can be much larger than the first without being unmanageable. In both spinning and manufacturing, businesses can be roughly grouped into the two classes; but it is in spinning that the second type of business is most completely realised.

Returning now to the figures for all Lancashire relating to spinning businesses of whatever form, we may say a word as to the large number of small firms. Many of these are doublers and waste spinners. Of firms doubling only, we find 56 giving particulars, very few being of the J form. Of these 17 have spindles not exceeding 10,000, and 28 have spindles from 10,000 to 20,000 (see Table III in Appendix). But there are 63 recorded firms (spinning, spinning and doubling, and doubling only) with fewer than 10,000 spindles, and 75 more with spindles between 10,000 and 20,000. Of cotton-waste spinners furnishing particulars, there are 13, all but one having no more than 15,000 spindles.

It must be remembered, of course, that other small firms returning spindles may be doublers or cotton-waste spinners, though they are not specifically so entered in the directory. As regards the remaining small firms which are neither doubling nor confining themselves to cotton waste, inquiry shows that many of them are engaged in special classes of work, such, for instance, as reeling, winding and warping.

It will probably prove of value to consider the changes which have taken place in respect of firms' magnitudes in spinning in the last quarter of a century. It is possible to do so, since Worrall's Directory, upon which we have relied, was started many years ago. The first exhaustive edition was that of 1884. The figures for 1884 in Table I are taken from this edition. In Figs. 1 and 2 facts relating to 1884 are expressed in dotted lines.[4] Looking at Fig. 1 and comparing the graphs for the whole industry in 1911 and 1884, we observe a more pronounced 10–20 thousand maximum in the earlier period with a relatively smaller proportion of 20–30 thousand spindle firms among the lesser firms, and at the same time the absence of the 70–100 thousand spindle maximum. In the graphs relating to Oldham, the first points are equally notable, but instead of the absence of the larger maximum we see it just existing in the smaller size of 70–80 thousand. Plausible explanations can be found without difficulty, but it is not always easy to choose between them. As regards the relative spreading out of firms into somewhat larger dimensions, we may remark that economic progress on the productive side has rendered the larger business more possible, partly as a result of the expansion of the industry, while more plentiful supplies of capital may have rendered economical a type of organisation on a larger scale. Among recent changes, it is sufficient to mention the specialisation and general improvement in the performance of the commercial functions associated with the industry (whereby much

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[4] Taking smaller units we have for Lancashire (see Table I) :—

	1884.	1911.
0— 2,500 spindles	22 firms	19 firms
2,500— 5,000 ,, ...	21 ,,	15 ,,
5,000— 7,500 ,, ...	27 ,,	14 ,,
7,500—10,000 ,, ...	33 ,,	15 ,,
10,000—15,000 ,, ...	77 ,,	42 ,,
15,000—20,000 ,, ...	77 ,,	33 ,,

trouble and anxiety have been shifted from the producers proper), industrial specialisation within the industry and subsidiary industries, and improved means of communication. As regards the shooting up since 1884 of the 70–100 thousand maximum, it may be remarked (1) that the joint-stock form of organisation has been perfecting itself of late years, so that to-day it is capable of undertaking kinds of management from which it was debarred a generation ago, and (2) that industrial differentiation, involving the stereotyping of certain forms of production, has afforded an expanding field for joint-stock enterprise. These last conclusions are borne out by a glance at Fig. 2, where we see the enormous increase in number and size of joint-stock enterprises since 1884 and the massive elimination of the P type. The graph showing the dispersion of the magnitudes of the former has leapt up, and, broadly speaking, moved to the right between 1884 and 1911. It may be noted that a comparison of 1884 with 1911 suggests a plausible explanation of the 70–80 thousand maximum which is only just less important than the 90–100 thousand maximum in 1911. It looks as if the former marked, in some degree at any rate, the survivals of the large joint-stock creations in their first and less gigantic shapes; but, of course, it may be that it marks also some difference of work or some rival type of organisation.

Summing up as regards the prevalence of typical sizes of firms carrying out exclusively spinning processes in and about Lancashire, we submit that the following points are suggested more or less strongly, if not definitely established :—

1. There was a dominant type of business which tended to be of some magnitude between 10,000 and 20,000 spindles and this type still exists but is tending to pass (or as regards recent enterprises has passed) into a size between 20,000 and 30,000 spindles.

2. There was a type of business (mainly joint-stock in constitution) of a 70–80 thousand spindle size. This type has grown in importance and has tended to pass (or as regards recent enterprises has passed) into a 90–100 thousand spindle size.

3. About the types there is a not irregular, though frequently lopsided, dispersion of business magnitudes.

These points we set forth here, with the object of showing the direction in which the investigation is leading. Discussion and explanation are reserved for a later stage.

Incidentally, it is of interest to observe that in the case of spinning it is possible to get a measurement of firms in respect of the degree of their specialisation as well as of their size.[5] Firms, as a rule, return to the Directory the range of counts spun by them, and from this information the number of kinds of yarn that they turn out can be deduced. Broadly speaking, the counts spun in Lancashire are 1's, 2's, 3's and so on in units of 1 up to about 15's; 16's, 18's, 20's and so on in units of 2 up to about 60's; and 65's, 70's, 75's and so on in units of 5 for the higher ranges. So, to take examples, a firm returning its output as 5's to 10's has a range of 6; a firm returning 10's to 30's has a range of about 14; and a firm returning 80's to 120's has a range of about 10. It was found, however, on making inquiries that businesses frequently specialise on a smaller range than they return; consequently the tabulation below must be regarded as representing broad features only.

Spinning only.

Range of counts.	Number of firms.				Increase or decrease of J. between 1891 and 1911.	Increase or decrease of totals between 1891 and 1911.
	1891.		1911.			
	J.	Total.	J.	Total.		
0— 5	31	91	44	71	+13	−20
5—10	59	132	108	146	+49	+14
10—15	51	121	91	123	+40	+ 2
15—20	34	75	59	84	+25	+ 9
20—25	10	39	34	58	+24	+19
25—30	3	12	10	24	+ 7	+12
30—35	....	7	3	8	+ 3	+ 1
35—40	3	11	2	7	− 1	− 4
40—45	1	4	2	5	+ 1	+ 1
45—50	....	4	1	5	+ 1	+ 1
50—55	....	3	1	2	+ 1	− 1
55—60	....	2	1	3	+ 1	+ 1
60—65	....	2	1	4	+ 1	+ 2

The dominance of the type with a range of 5 to 10 counts is marked both in 1891 and 1911, and the dispersion of other degrees of specialisation about the type is significantly regular for both periods. As the outstanding arrangement means fairly narrow specialism, a wide range of variations showing more specialism is not possible. The degree of specialism in cotton spinning has been settled *inter alia* by the economies of specialised machinery, the extent to which a given equipment of machinery can be satisfactorily set to different counts, the trouble of resetting, and the range of counts that can be got with reasonable ease from a given mixing of cotton. There is one astonishing but unmistakable indication in the table, namely, that extreme specialism has been getting relatively less instead of relatively greater, and that the tendency has been associated with joint-stock initiative. One cause of this tendency is undoubtedly the spread of what may be called "parallelism," meaning the adoption of a double or treble specialism. It was to be expected that the influence of joint-stock enterprise would be in the direction of a more concentrated product, on the ground that this is suited to specialised industrial functioning. But actually the ease with which it can gather capital, combined with the advantages of parallelism, has of late resulted in the opposite effect. It is only large firms which can adopt parallelism. Sometimes the duplication only starts at a certain stage in the productive process, but sometimes it exists from the first stage. In 1911 as many as 47 firms returned a double range separated by a gap, and of these 34 were of the J order and only 3 private. Sometimes the parallelism simply means that a business spins up on a lower range the waste resulting from the cardings for a higher range.[6]

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[5] The inquiry into industrial specialisation, of which an account is given here, is part of an investigation made by Mr. A. N. Shimmin, which has not yet been published.

To complete the tale for the British Isles we now present tables showing size dispersion for Yorkshire and the rest of the British Isles. Statistics for the industry in these parts we have previously left over with the object of keeping the facts relating to the concentrated Lancashire industry distinct. For parts outside Lancashire it will be seen (Table IV in Statistical Appendix) that in spinning the small type is outstanding. This is not surprising in view of the fact that concentration with its external economies of a local character, commercial and otherwise, encourages magnitude in the business unit; but probably the most important reason for the smallness of type outside Lancashire lies in the fact that many of the firms outside Lancashire carry on doubling, or spinning and doubling, particularly in the Yorkshire area. Of 135 exclusively spinning firms giving particulars, out of 198 in all, 47 have no more than 10,000 spindles, 26 have 10–20 thousand spindles, and 15 between 20 and 30 thousand spindles. It should be noted that the figures for Yorkshire are more representative than those for the other areas of the United Kingdom exclusive of Lancashire: 101 out of 130 firms in Yorkshire particularise, but only 34 out of 68 elsewhere.

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[6] There is frequently a sort of parallelism in weaving-sheds, and when firms have two or more mills or weaving-sheds.

We consider next cotton spinning in the United States. Almost all the firms mentioned in the American Directory give particulars as to the number of spindles and looms employed, only about 90 firms out of 1402 in the whole industry failing to do so. But as it is not always possible to determine to what branch of the industry (spinning, weaving, or both) a firm which does not specify belongs, we have not been able to give the exact number of firms in each branch.[7] Results are shown in Table V and Fig. 3. One striking thing is the smallness of the prevailing type. In the figure, units of 10,000 spindles are taken, but this unit is too large to show variations in size of the smaller firms. As regards these variations, Table V (in the Appendix) shows as follows:—

Spindles.	Northern States.	Southern States.	Total.
— 2,500	24	25	49
2,500— 5,000	24	73	97
5,000— 7,500	15	67	82
7,500—10,000	15	52	67
10,000—15,000	13	51	64
15,000—20,000	15	19	34

It appears that 2.500-5.000 is the dominant type. Another striking thing is the regularity of the dispersion of the larger magnitudes, particularly in the Southern States.

It must be pointed out that the number of small firms is not so great as these figures would suggest, as firms have not been excluded which possess, in addition to spindles, machines such as braiders. It is also noteworthy that circumstances affecting water-power, which is extensively resorted to, impose restraints on the magnitude of some businesses. Again, in the South there is the difficulty of getting white labour—black labour is kept outside the factories. The Southern industry, as a considerable thing, is comparatively recent, and white labour was thinly scattered over the localities where the cotton industry appeared. To get sufficient white labour, even for a small mill, a large area had to be drawn upon.

As regards regularity of size dispersion in the case of mills, one cause, no doubt, with respect to the South, is the absence of types marking historical survivals, since the foundation of the industry is recent. The absence of these disturbing survivals makes the

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[7] Certain of the very large corporations have their headquarters in New York and their spindles and looms, wherever located, are entered under the head of "New York City." In a few cases, therefore, it has not been possible to keep within our original definition of a firm.

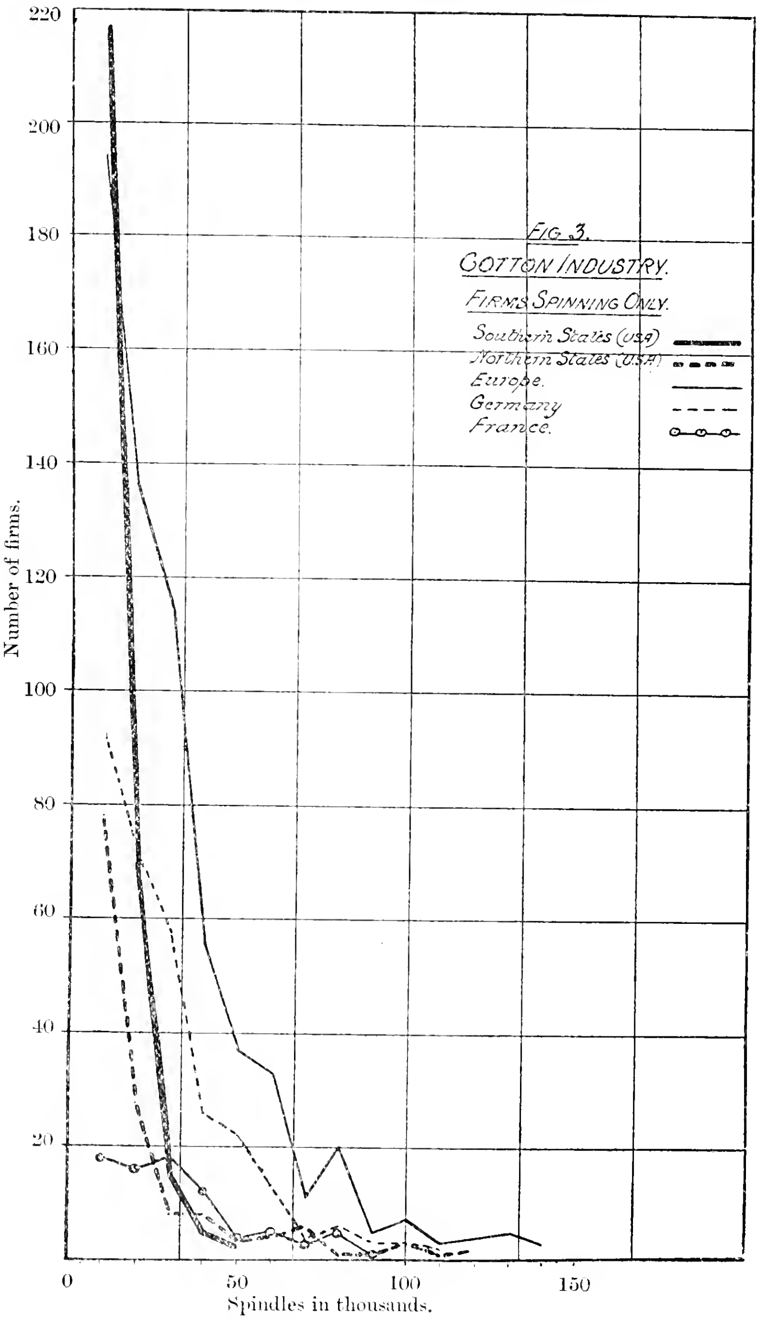
FIG. 3.
COTTON INDUSTRY.
FIRMS SPINNING ONLY.
Southern States (USA)
Northern States (U.S.A.)
Europe.
Germany
France.
220
200
180
160
140
120
100
80
60
40
20
Number of firms.
0
50
100
150
Spindles in thousands.

Southern industry peculiarly valuable for the purposes of the present inquiry. Another reason for regularity of size dispersion among American cotton-spinning firms is that they almost exclusively use the ring-spindle, with the result that the businesses are more of the same nature than in cases where the spinning may be mule or ring.

Europe may engage our attention next. The facts relating to firms furnishing particulars are set forth in Table VI.[8] The proportions of firms returning their spindles, which are mostly ring-spindles, are as follows :—

Country.	Number of firms furnishing particulars.	Total number of firms in directory.	Percentage of firms furnishing particulars.
Austria	45	114	39
Belgium	32	32	100
Denmark	2	3	67
France	83	168	49
Germany	308	310	99
Holland	4	5	80
Norway	1	1	100
Russia	68	73	93
Spain	44	44	100
Sweden	7	9	78
Switzerland	44	44	100
Total	638	803	79

The degree to which the figures in Table VI can be regarded as representative thus varies considerably according to the country. No firms spinning exclusively are found in Portugal, although there are 11 firms weaving exclusively and 15 performing both processes. It should be noted that no figures for Italy are available. According to the Directory, there are 603 firms of all kinds (spinning, weaving, and combined) in Italy, but no information as to the number of spindles and looms is given. Most of the spinning in Europe is done on the ring-frame, but the percentage of mule-spinning in Switzerland is much higher than in the rest of Europe, since fine counts are needed for the laces, muslins and embroideries produced in the Swiss manufactures.

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[8] Among particularising firms *Société Anonyme* accounts for 3 out of 83 in France and 8 out of 32 in Belgium, *Aktien Gesellschaft* for 5 out of 45 in Austria and 12 out of 68 in Russia *Aktiebolag* for 6 out of 7 in Sweden, while *Aktien Gesellschaft* and *Gesellschaft mit beschränker Haftung* account for 36 out of 308 in Germany. We give here what directories show without being able to make any comment as regards accuracy. Taking the six countries together, of the kinds of businesses mentioned there are 8 with 0–10,000 spindles, 12 with 10,000 to 20,000, 12 with 20,000 to 30,000, 11 with 30,000 to 40,000, 5 with 40,000 to 50,000, 8 with 50,000 to 60,000, and no more than 2 of any other size.

The facts for Europe, Germany and France are displayed in Fig. 3. To complete the figure the following minuter details may be added (see Table VI):—

Spindles.	Firms in Germany.	Firms in Europe outside Italy.
0— 2,500	17	32
2,500— 5,000	20	44
5,000— 7,500	29	52
7,500—10,000	27	66
10,000—15,000	41	74
15,000—20,000	30	62

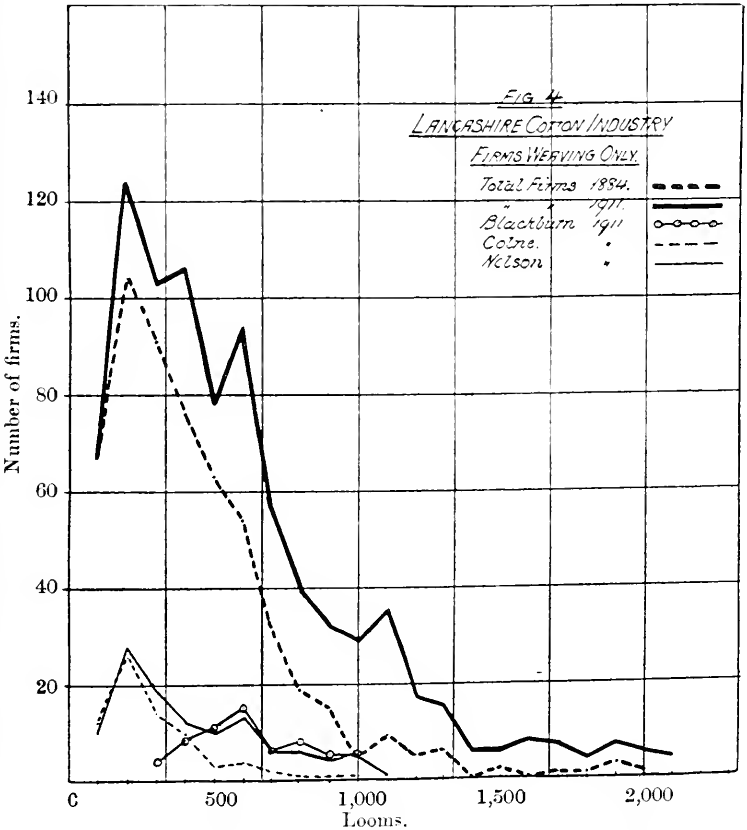
The concentration would seem to be at 7,500–10,000 for Europe as a whole, while for Germany it is just, but only just, on the lower scale of 5,000 to 7,500.

Taking the facts as a whole, there are several notable points. First we remark the dominance of the small firm; secondly, that the 70–80 thousand maximum (which exists in England but has been surpassed by a 90–100 thousand maximum) is appreciable in Europe as a whole, and evident in Germany, France, Austria and Russia; and, thirdly, the comparatively regular dispersion about types. It is significant that the graph for Lancashire in 1884 seems to fit in as an intermediate link between the graph for Europe and the graph for Lancashire in 1911. The three graphs in the order given might on the face of them be taken to mark stages in the process of development of a single industry. Explanation may be deferred, except to point out that the small degree of localisation in Europe, as compared with Lancashire, keeps down the size of the firm specialised by process as it seems to do also in the British Isles outside Lancashire (see Table IV). Some degree of localisation is to be observed at Barcelona in Spain, at Gand (Flandre Orientale) in Belgium, at Crimmitschau and Werdau in Saxony, at Gladbach and Rheydt in Rhenish Prussia, around Mülhausen in Alsace, and at Lodz, St. Petersburg and Moscow in Russia. This localisation is accompanied in several of the districts by a higher degree of process specialisation than elsewhere, spinning and weaving tending to be organised in separate firms, but it does not appear to have any marked effect on the size of the individual firm. Water power is still used extensively, either alone or in conjunction with steam or electric power, in Spain, Switzerland and elsewhere; and, as already suggested, this may have an influence on the dimensions of the firm.

In the East there is nothing of much importance to record. The facts are shown in Table VII. In India and Japan all the firms spinning exclusively give particulars as to the number of spindles employed, and in China 20 of the 21 firms particularise. In India 77 out of 84 firms are of the J order, in Japan 18 out of 26, and in China 6 out of 21. The number for India is alone sufficient to generalise from. There we find a 15–20 thousand-spindle firm predominating, while the classes 30–40 thousand and 40–50 thousand are important.

Section B.—*Weaving.*

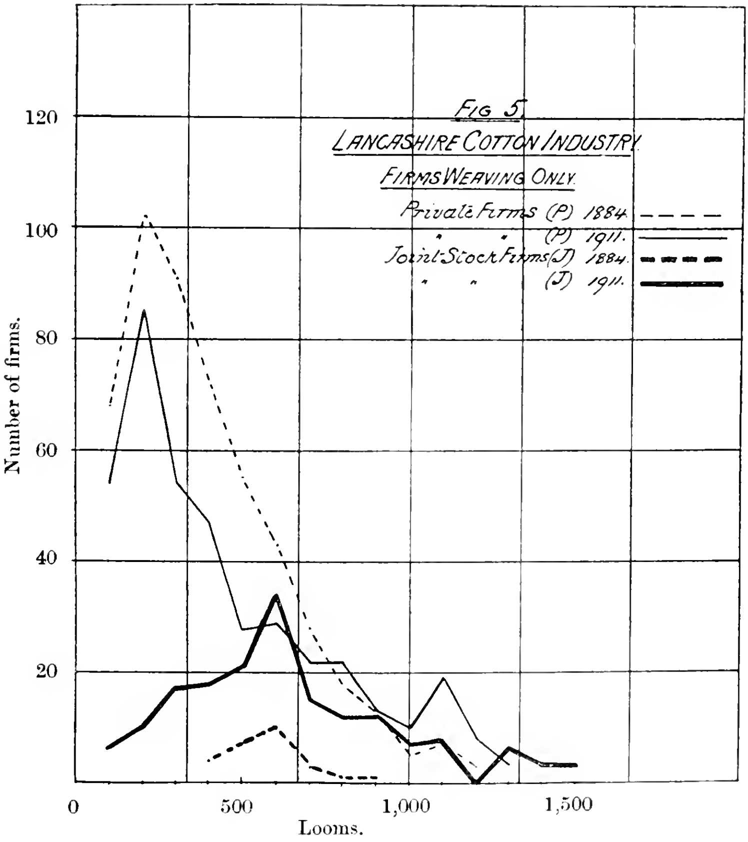
In this section we deal with the facts regarding the dispersion of business magnitudes in the case of firms which weave only. In the Lancashire district 855 out of about 900 have provided



information. Taking the statistics in Tables VIII and IX, relating to all the particularising manufacturing firms in the Lancashire district which weave only, and Fig. 4, which is based upon totals, we find that in 1911 there were three chief maxima points, namely, 100 to 200 looms per business—which from detailed figures (see Table VIII) would seem to be in the neighbourhood of 150 looms—500 to 600 looms per business, and 1,000 to 1,100 looms per business. In 1884 the first maximum only is prominent, though the 1,000–1,100 is just appearing, and, as in 1911 so in 1884, the small maximum would seem to be in the neighbourhood of 150 looms (see Table IX). About the maxima points there appears to be, as in the case of spinning, a moderately regular dispersion when the facts are very broadly regarded. Thus it would seem, *prima facie,* as if in manufacturing there were at present three pronounced business types with a not irregular arrangement of magnitudes about each.

Proceeding next, as in the case of spinning, to split up the aggregate into its constituents by analysis of districts (on the ground that local specialisation in particular types of work, and, therefore, in types of business arrangement, might afford some explanation of the aggregate dispersion of business types) we find as follows as regards 1911. The 100–200 maximum prevails at Colne, Nelson, Radcliffe and Todmorden, and exists at Burnley, and in these cases it would equally seem to be in the neighbourhood of 150. The 500–600 maximum prevails at Preston, Accrington and Blackburn, and appears also at Nelson and very faintly at Colne, while a 400–500 one prevails at Burnley. The 1,000–1,100 maximum is pronounced at Blackburn and slightly noticeable at Preston, while at Burnley it is just transcended by one of 900–1,000. At Accrington 900–1,000 and 1,000–1,100 are equally on the margin of standing out. In Fig. 4 graphs for Colne, Nelson and Blackburn are included. Thus a district investigation affords some support for the view that our complex aggregate graph relates to two or three types at least.

Following the order of discussion adopted in the case of spinning, we may now consider the number of businesses of each size when we classify businesses under the three heads of private businesses and partnerships (P), companies (C), and joint-stock enterprises (J), as previously defined. As already pointed out, we cannot be sure of our boundaries between P and C and between C and J. This step in the investigation is worth taking, because it is not improbable that different classes of business may be suited to different types of organisation, and consequently tend to be organised in different ways. The statistics show that in the case of private firms and partnerships there is one maximum, at 100–200 in 1884, which predominates also in 1911, though in the latter year the 500–600 maximum is just emerging, and another at 1,000–1,100 has developed; that the chief maximum for the companies is 300–400 looms, while a secondary one of 500–600 and another of 900–1,000 are noticeable; and that in the case of the joint-stock companies the outstanding maximum is 500–600, while a secondary maximum of 1,000–1,100 has been growing up since 1884. The facts are set forth diagrammatically in Fig. 5. Thus analysis of the facts by type of organisation brings out similar results in spinning and manufacturing. Some features of each graph are due to one type and other features to another type. Also pretty much the same change as in spinning is apparent when we contrast 1884 with



1911 in manufacturing. In 1884 dispersion was fairly regular in a lop-sided way about the 100–200 maximum, but by 1911 two higher maxima became outstanding. We have discussed the extent to which joint-stock enterprise was associated with the change.

Full details as regards types of organisation in different districts will be found in Tables VIII and IX, for 1911 and 1884 respectively. The percentages of different types of organisation in different districts vary greatly. They are shown for 1911 in Table X. The explanation is largely district specialisation. The "limited" principle flourishes extensively in the staple industry for Eastern markets. Hindoo taste changes very slowly; hence there is less necessity for quick adaptation, and the limited principle and a larger scale of production can be applied. Colne and Nelson, with their concentration on fancy goods, satteens, ginghams and similar products, have less than 10 per cent. of their firms joint-stock in origin. Accrington and Blackburn, producing jacconettes, dhooties and T-cloths for Eastern markets, have a much higher proportion. The percentage advance of joint-stock enterprise in manufacturing has been very great since 1884; but figures make it plain that it is spinning which has proved its most fruitful field.

One reason for the very small firm is the opportunity afforded it by the prevalence of what is known as the "room and power" system.[9] A firm may not occupy the whole of a building. One set of forces settle the size of the building and another the size of the firm when the two need not coincide. Thus in Nelson there are 119 cotton manufacturing firms but only 33 weaving-sheds, most of which are let on the "room and power" system. The sheds are used as follows:—

Number of sheds occupied by	1 firm each	8
,,	2 firms ,,	5
,,	3 ,, ,,	6
,,	4 ,, ,,	1
,,	5 ,, ,,	5
,,	6 ,, ,,	4
,,	7 ,, ,,	3
,,	8 ,, ,,	–
,,	9 ,, ,,	1
		33

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[9] The causes for the existence of the very small firm were dealt with in detail in a Paper read to this Society in February, 1912.

Similar conditions obtain in other places in Lancashire, but to an appreciable extent in manufacturing only, so far as we can gather. The system has developed in the main in North-East Lancashire, where of late years there has been a great expansion of the cotton industry. It is significant to find the "room and power" system flourishing most in a district the importance of which is recent. It existed in early days, but in most cases of its existence to-day it is new.

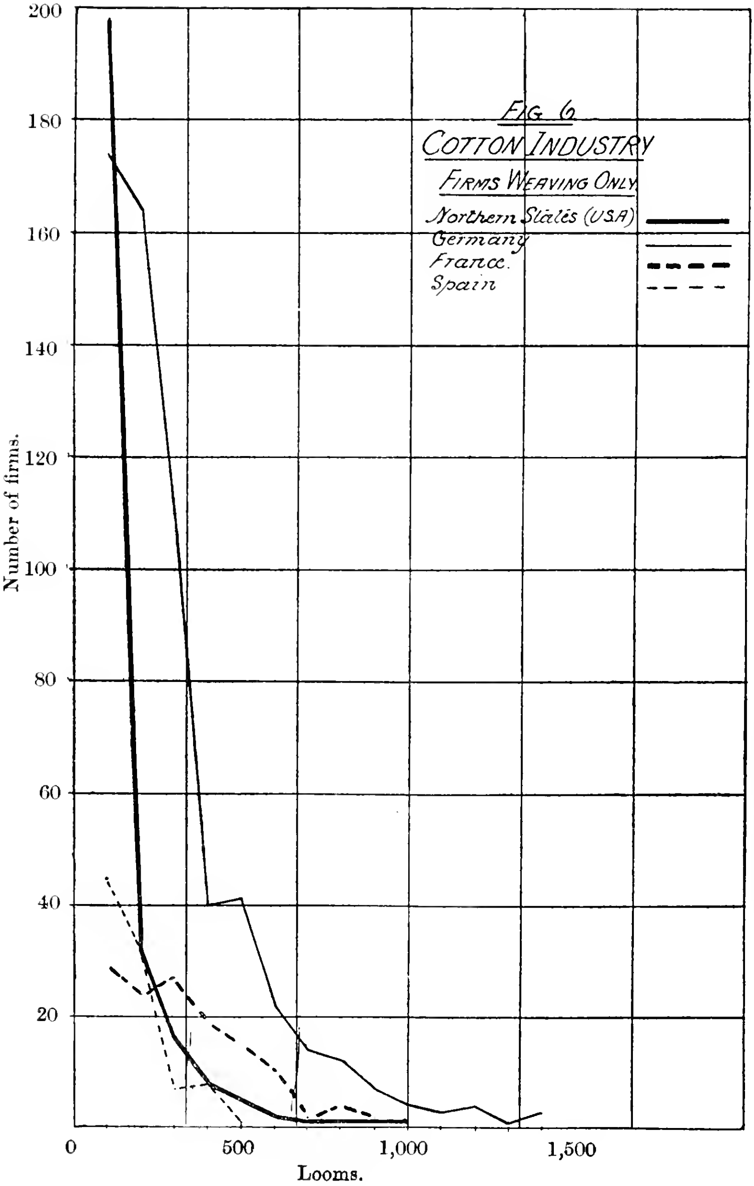
Facts outside the Lancashire district are recorded in Table XI. Out of 136 firms 114 have furnished particulars. Of the 136, as many as 92 are in Yorkshire. The maxima are 100–200 (really 150–200) and 400–500.

In the United States practically all the isolated weaving is to be found in the North. In the South the industry is too recent in origin, marketing facilities are too weak, and the supply of technically trained labour is too small, to allow of a strong development of weaving apart from spinning. Full details are incorporated in Table XII, as regards the 268 firms returning the number of looms. The striking thing is the small type of 1–25 looms (93 firms), and the rapid descent in the number of firms for the larger sizes (see Fig. 6). The large number of very small firms is to some extent misleading, since many of them have other machines also, such as braiders, and it was impossible to take account of these machines without seriously complicating our tables.

Table XIII contains statistics for Europe (excepting Italy). The following are the proportions of firms making statistical returns to the total number of firms in the Directory:—

Country.	Number of firms furnishing particulars.	Total number of firms in Directory.	Percentage of firms furnishing particulars.
Austria	39	462	8
Belgium	10	10	100
France....	141	371	38
Germany	603	623	97
Holland	35	42	83
Portugal	10	11	90
Spain	93	102	91
Sweden	4	16	25
Switzerland	40	40	100
Total	975	1,677	62

In Denmark and Norway there are no firms weaving exclusively. In Russia 191 firms are recorded in the Directory, but none states the number of looms employed. It will be observed that the proportion of firms particularising is lower than in the case of firms spinning exclusively.



The small firms with 50–100, 100–150 and 150–200 looms largely preponderate in Europe taken as a whole (see Table XIII). Beyond 200 looms the larger the firm the much less is the number in existence, apart from a single exception in the case of firms of 700–800 looms. Details are shown diagrammatically in Fig. 6 for Germany, France and Spain. The diagrams may be supplemented with the following observations. On the basis of a unit of 25 looms the maxima are evidently 75–100 looms for Germany and 25–50 for Spain (see Table XIII). On a 50-loom unit France's chief maxima are primarily 250–300 and secondarily 50–100. In Germany 38 of the 603 recorded firms are of the orders *Aktien Gesellschaft* or *Gesellschaft mit Beschränkter Haftung*. In France 2 of the 141 recorded firms are of the order *Société Anonyme*, and in Sweden 2 of the 4 recorded firms are *Aktiebolag*.

The figures in Table XIII are not an entirely satisfactory index of the size of firms manufacturing only, and caution should be observed in comparing them with those of other regions. The union of dyeing and finishing with weaving is not uncommon on the Continent and, in consequence, our figures tend somewhat to understate the dimensions of firms. In this country, as already stated, the union of the dyeing and finishing processes with weaving is extremely rare, though it still exists to a substantial extent in the United States. It should also be added that some of the firms of which account has been taken in Table XIII are not purely cotton manufacturing firms. Cotton yarn is often used side by side with wool, linen and silk yarns, and the dividing line between the various textile industries is a blurred one. As far as possible firms in which cotton appears to be the staple raw material have alone been included.

In India and Ceylon there are but 13 power manufacturing firms in the cotton industry weaving only, and in Japan but 2 furnishing statistics, while in China such firms do not exist. According to the Directory there are 7 firms in the Canadian industry weaving exclusively.

Section C.—*Combined Spinning and Manufacturing.*

A combination of spinning and manufacturing is not at the present time the most common arrangement in England. In the Lancashire district less than 16 per cent. of the firms are combined. Some 70 per cent. of the firms which spin at all spin only, and have under their control 77 per cent. of the spindles; while some 75 per cent. of the firms which weave at all weave only, and have under their control some 65 per cent. of the looms. In

Yorkshire about 2 per cent. of the cotton firms are combined;[10] and in the rest of the British Isles outside Lancashire and Yorkshire about 34 per cent. Between 1884 and 1911 the tendency for spinning and manufacturing to be conducted independently in the Lancashire district has largely increased. The combined firms fell in number from about 470 to 300 between 1884 and 1911. The cause is, no doubt, the economy of business specialisation and its possibility in the concentrated Lancashire industry with its convenient marketing centre, its organised commercial system and developed means of transportation. Full details will be found in Table XIV. It is interesting to notice that in 1911 among spinning firms there is a preponderance of joint-stock companies, among weaving firms of private businesses and partnerships, and among combined firms of companies. Of the combined firms 23 per cent. are P and 21 per cent. J. After what has been said already the explanation would seem to be obvious.

In the United States the combined firm is much more common, as the following figures show:—

United States.

	Number of firms.				Percentage.			
	Spinning.	Weaving.	Combined.	Total.	Spinning.	Weaving.	Combined.	Total.
Northern States	146	256	260	662	22·1	38·7	39·2	100
Southern States	311	12	414	737	42·2	1·6	56·2	100
Total	457	268	674	1,399	32·7	19·2	48·1	100

The facilities for separation described above as existing in Lancashire are absent from America.

In Canada, of 23 firms 13 are combined, while 7 weave only and 3 spin only.

In Europe a high degree of differentiation exists. Taking the total firms of which a record is given in the Directory, we find 803 spinning exclusively, 1,584 weaving exclusively, and 499 (or about 17 per cent.) combining both processes. The proportion of firms of the combined order naturally varies somewhat from one country to another. In Germany it is 13 per cent., in France 14 per cent., in Austria 9 per cent.. and in Russia 24 per cent. The relatively high degree of differentiation in the generally scattered European industry may be partly due to historical causes. Abroad, roughly speaking, power manufacturing was developed first and was followed by coarse and medium spinning.

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[10] The reason for the small degree of combination of processes in the cotton firms of Yorkshire is probably to be found in the fact that no more than two branches of the cotton industry exist there, generally speaking, and that these branches do not happen to be of the combined order. The firms weaving only are found localised in Skipton and Barnoldswick—a continuation into Yorkshire of the N.E. Lancashire weaving district. The firms spinning exclusively are found mainly in the Huddersfield district.

In India, of 229 firms which give particulars out of a total of 232 (working 240 factories), 36 per cent. spin only, 6 per cent. weave only, and 58 per cent. are combined. In Japan (where there are 43 firms and 109 factories) 60 per cent. spin only, 5 per cent. weave only, and 35 per cent. are combined. In China (with 25 firms and 28 factories) 83 per cent. spin only and 17 per cent. both spin and weave.

The question arises as to whether it is possible to lay down any generalisations with reference to types of combined firms. We begin with Lancashire. In the two tables below we show the numbers of looms and spindles in particularising firms in the Lancashire district for 1884 and 1911, a few firms of an exceptionally large size being omitted. Firms to the number of 446, out of about 470, furnished details in 1884, and to the number of 279, out of about 300, in 1911. In the tables the maximum in each vertical column is printed *black*, and the maximum in each horizontal column is printed *large*. When a horizontal maximum and a vertical maximum coincide the number marking it is printed *large and black*. Maxima are not indicated in columns containing few numbers.

Inasmuch as the maxima points are not scattered but cluster about a diagonal line, it is suggested that a tendency is operating, though it may be faintly, for looms and spindles to combine within a certain range of ratios in mixed firms. The typical ratio of looms to spindles would appear to have been between $\frac{1.750}{100,000}$ and $\frac{1,500}{100,000}$ in 1884, if generalisation is possible at all. By 1911 it had become more and approximated to $\frac{2,000}{100,000}$ as the upper limit. One way of showing that change has taken place is to average the ratios marked by each maximum point, counting twice any figure which is both a vertical and a horizontal maximum. When this is done the average for 1884 comes out at $\frac{162}{11,000}$ and that for 1911 at $\frac{235}{11,000}$.

*Combined firms. Lancashire cotton industry,** 1911.

Looms.	Spindles in thousands. 25	50	75	100	125	150	175	Total
2,750–2,500	—	1	1	2	—	1	—	5
2,500–2,250	—	—	1	2	—	—	—	3
2,250–2,000	—	—	3	—	2	—	—	5
2,000–1,750	—	1	4	6	2	1	—	14
1,750–1,500	1	4	6	2	1	1	—	15
1,500–1,250	4	6	3	4	—	—	2	19
1,250–1,000	3	9	8	3	—	—	1	24
1,000–750	5	23	8	2	1	1	—	40
750–500	20	16	5	1	—	1	—	43
500–250	44	8	2	—	1	—	1	56
250–0	42	1	—	—	—	—	—	43
Total	119	69	41	22	7	5	4	267

* 12 firms of large size fall outside the limits of this table.

*Combined firms. Lancashire cotton industry,** 1884.

Spindles in thousands.

Looms.	25	50	75	100	125	150	175	Total
2,750								
	—	—	1	1	2	1	1	6
2,500								
	—	—	—	1	1	—	1	3
2,250								
	—	—	1	3	1	2	—	7
2,000								
	—	2	2	5	2	—	—	11
1,750								
	—	1	2	6	1	—	1	11
1,500								
	3	4	5	**7**	1	2	—	22
1,250								
	7	8	8	3	—	—	—	26
1,000								
	7	31	**11**	3	—	1	—	53
750								
	36	**41**	7	—	—	—	—	84
500								
	85	28	4	1	—	—	1	119
250								
	93	6	2	1	—	—	—	102
0								
Total	231	121	43	31	8	6	4	444

* Two firms of large size fall outside the limits of this table.

But it is not only the tendency to a fixed ratio to which attention should be summoned. This, in fact, is a minor detail. The point of general importance is the comparative regularity of the arrangement of the figures. If we imagine a surface raised above the table the heights of various points on which are indicated by the figures in the table, we have a hill, bounded by a cliff on both sides at the south-west corner, so to speak, but sloping away in a fairly unbroken manner to the north and north-east. It may be pointed out at once that broadly similar features characterise the surfaces indicated in like manner by the other tables of combined firms which follow. Something of the regularity of slope may be read in the columns of totals to the right and at the bottom of the tables.

Comparing 1884 with 1911, we observe that in 1884 there were most firms with 1–250 looms and 1–25 thousand spindles; but in 1911 the firms with 251–500 looms and 1–25 thousand spindles surpassed them in numbers. Firms with many looms are getting relatively more common. The great relative decrease of the firms with 1–250 looms and 251–500 looms and the great relative increase of those with more than 500 looms will at once attract notice.

It is unfortunate that we grouped our material in such large units that the largeness of the unit has covered up tendencies. Our excuse must be that the use of smaller units would have largely added to our labour—let those whose daily reading has for months been the pages of Directories make the first complaints. We may supplement our statistics by saying that the firms with few looms are in large part firms which manufacture in the main and have, in addition, a few spindles, and that the spindles in such firms are frequently specified as "doubling," "condenser" or "twiner."

In the next two tables the facts are displayed for the Northern and Southern industries of the United States. In both the maxima cluster about a diagonal line and tend to a ratio between $\frac{1,750}{75,000}$ and $\frac{1,500}{75,000}$, which roughly corresponds with the English ratio; and in both there is the simple kind of dispersion upwards and to the right already referred to. The similarity in form of the Northern and Southern industries in the United States is remarkable, but the former has relatively far more large firms, as one would expect from its greater age and the greater development of its economic environment, including local supplies of labour. In the Northern States there are also many more very large combined firms than in England. The large ones are not shown on the above table for Lancashire, and there are 16 firms in the Northern States of America of such a size that they even fall outside the more comprehensive table for the Northern American States. English large-scale enterprise has been at work mainly in the fields of exclusive spinning and exclusive manufacturing. Again we notice the relatively large number of firms with no more than 500 looms in the Southern States as compared with the Northern States and with England even in 1884.

*Cotton industry. Northern States (U.S.A.). Combined firms.**

Spindles in thousands.

Looms.	25	50	75	100	125	150	175	Total
4,250								
4,000	—	—	—	—	—	—	1	1
3,750	—	—	—	—	3	1	1	5
3,500	—	—	—	1	1	1	—	3
3,250	—	—	—	1	2	2	—	5
3,000	—	—	—	1	—	1	—	2
2,750	—	—	—	1	7	4	—	12
2,500	—	—	—	5	3	1	1	10
2,250	—	1	1	3	1	—	—	6
2,000	—	—	2	3	—	—	—	5
1,750	—	1	5	6	—	—	—	12
1,500	—	2	**12**	1	—	—	—	15
1,250	—	3	**16**	1	—	—	—	20
1,000	1	**12**	6	—	1	—	—	20
750	1	**14**	4	—	—	—	—	19
500	**15**	12	1	—	—	—	—	28
250	**30**	3	—	—	—	—	—	33
0	**43**	4	1	—	—	—	—	48
Total	90	52	48	23	18	10	3	244

* 16 large firms fall outside the limits of this table.

*Cotton industry. Southern States (U.S.A.). Combined firms.**

Spindles in thousands.

Looms.	25	50	75	100	Total
2,750	—	—	—	3	3
2,500	—	—	—	3	3
2,250	—	—	1	2	3
2,000	—	—	8	2	10
1,750	—	—	**13**	—	13
1,500	--	8	**12**	—	20
1,250	1	**12**	3	—	16
1,000	6	**27**	—	—	33
750	**44**	16	1	—	61
500	**115**	6	—	—	121
250	**126**	4	—	—	130
0					
Total	292	73	38	10	413

* One large firm falls outside the limits of this table.

In the next table are statistics for Europe. The Directory gives particulars for 434 out of a total of 499 firms. A ratio something like $\frac{1,250}{75,000}$ is indicated (so far as there is any indication), which is similar to the English and American ratios, and the regularity of dispersion described on p. 495 is brought out. The relative numbers of firms with less than 500 and less than 250 looms would seem to be about the same as in the Southern States of America. Of the 434 particularising firms, 31 fall without the limits of the table, and 17 of these, as well as many of those which just fall within, are in Russia. This tendency to a large scale of production in Russia affords matter for speculation. It is significant that nearly all the large mills in Russia are either controlled

*Cotton industry. Europe. Combined firms.**

Looms.	Spindles in thousands. 25	50	75	100	Total
2,500					
	—	—	2	2	4
2,250					
	—	1	3	3	7
2,000					
	—	3	8	2	13
1,750					
	—	3	4	3	10
1,500					
	1	4	3	—	8
1,250					
	4	15	10	—	29
1,000					
	12	24	3	—	39
750					
	38	26	4	1	69
500					
	80	13	5	2	100
250					
	115	4	5	—	124
0					
Total	250	93	47	13	403

* 31 large firms fall outside the limits of this table, 17 of which are in Russia.

by English or German firms, or have English or German managers. The scarcity of the requisite undertaking and managing power in Russia may be one reason for the large firm—the "undertaker" in consequence being worked intensively rather than extensively.

For the East the only table worth giving is that for India. Here we find results not unlike those for Lancashire in 1911.

Cotton industry. India. Combined (spinning and weaving) firms.*

Looms. \ Spindles in thousands.	0—25	25—50	50—75	75—100	100—125	Total
1,750—2,000	—	—	—	1	1	2
1,500—1,750	—	—	1	—	—	1
1,250—1,500	—	2	**4**	—	1	7
1,000—1,250	—	**7**	3	—	—	10
750—1,000	2	**12**	1	2	—	17
500—750	3	**22**	—	—	—	25
250—500	**34**	7	1	—	—	42
0—250	**23**	—	1	1	—	25
Total	62	50	11	4	2	129

* 3 large firms fall outside the limits of this table.

As in the case of exclusive spinning, so in the case of spinning combined with weaving, we find a type of specialisation with some regularity of dispersion about it.[11] In the table beneath this is

Spinning in combined firms in the Lancashire area.

Range of counts.	1891.	1911.	Increase or decrease.
0— 5	60	46	− 14
5—10	82	70	− 12
10—15	58	52	− 6
15—20	29	20	− 9
20—25	21	23	+ 2
25—30	11	3	− 8
30—35	2	2	0
35—40	2	2	0

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[11] This part of the investigation was done by Mr. A. N. Shimmin.

shown for the Lancashire industry. The interpretation of the table has already been explained (on p. 479).

The outstanding 5–10 range and the unlikelihood of large departures from it are the impressive features. Between 1891 and 1911 no remarkable changes seem to have taken place. Comparing the table above with the corresponding one for independent spinning, we observe two points of some significance, namely, that the type is the same but that in the case of combined firms there has not been so marked a movement to a higher range. Of the first point the explanation is that combined spinning is subject to much the same laws as independent spinning. The spinning in a combined firm is not infrequently a separate business in effect. The whole or the bulk of the output of yarn is sold, while for the weaving the whole or the bulk of the yarn is bought. Of the second point the explanation is that the spinning business combined with weaving is naturally organised on a smaller scale and is not growing.

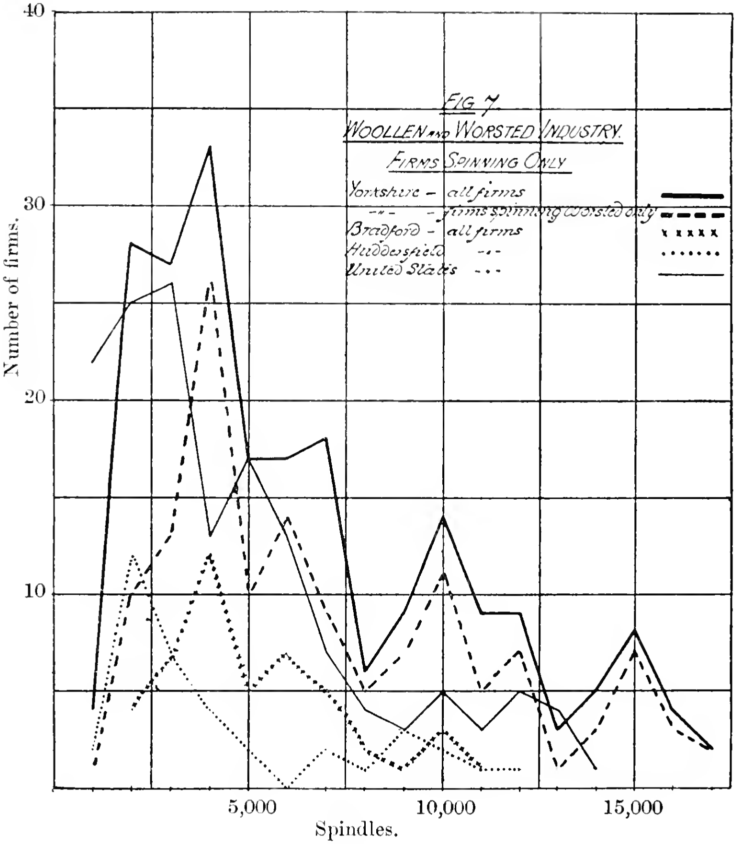
PART II.—THE WOOLLEN AND WORSTED INDUSTRY.

The industry is of two types—woollen and worsted. The main distinction is that yarn for worsted is of longer staple and is combed instead of being carded. But no clear line of demarcation can be drawn between the two types, and in the figures given in our tables relating to the British Isles those firms only which are clearly specialising in worsteds are reckoned as worsted firms. All firms described as producing woollen and worsted goods are treated as woollen firms.

Section A.—*Spinning.*

In the British Isles the worsted industry is more centralised (in Yorkshire) than the woollen industry, which is to be found scattered throughout the British Isles. The facts are set forth in Tables XV, XVI, and XVII in the Appendix. The figures for the Yorkshire industry relate to 245 firms out of about 360. We have particularised separately those firms which return themselves as spinning worsted yarns only, but our figures are not exhaustive of such firms, since many firms do not state for which industry they are spinning. Consequently the figures for worsted spinning must be taken as illustrative only. Generally speaking, the worsted industry has the spinning and weaving branches separately organised.

The highest graph in Fig. 7 relates to all spinning whether worsted or woollen or both. Its vacillating nature is doubtless



due in no small measure to the fact that it relates to different kinds of work or different kinds of organisation. This is brought out by a district analysis. Bradford is the home of worsted and Huddersfield of woollens, though neither place specialises exclusively. The graphs on the diagram for Bradford and Huddersfield reveal a 4,000-spindle maximum at the former place and a 2,000-spindle maximum at the latter place. And both curves are moderately simple. It would seem that worsted spinning has three outstanding maxima, namely, in order of importance, 4,000, 6,000 and 10,000—the final 15,000 peak stands for 7 firms only. For woollen spinning the chief maximum would seem to be 2,000 spindles.

It is suggestive that in spinning few of the firms are "limited" either of the C or J type. Only 67 out of 245 in Yorkshire, and 4 out of 32 elsewhere, are of this form. The percentage of this form is the higher the larger the firm. Another point of interest is the large number of small firms, which is partly due to the prevalence of working on commission.

We now turn to spinning in the United States. The facts are collected in Tables XVIII and XIX. Almost every firm in the Directory furnishes particulars. Of the 172 particularising firms in the American woollen and worsted industry engaged in spinning only, 98 are employed in spinning worsted or worsted and woollen yarn, and 74 in spinning woollen yarn only. In Fig. 7 the graph for all spinning is contained, and in Table XIX in the Appendix the figures for worsted and combined worsted and woollen spinning will be found. It appears that the outstanding maximum for worsted spinning is probably 4,000–5,000 spindles, whereas it is 3,000-4,000 in Yorkshire. There is a secondary maximum of 2,000–3,000 spindles, but this may be due to the fact that firms combining woollen with worsted spinning come into the figures. It would also appear that the type for woollen spinning is small as in England. It is notable, too, as regards range of size, that no exclusively woollen-spinning firm has more than 15,000 spindles, whereas 23 of the remainder have more than that number.

We took out separately all firms described as corporations, but as the figures explained little they are not included in the tables. Of the 172 firms, 118 were described as corporations. Certain generalisations are possible. There was a markedly higher percentage of worsted firms marked corporations than of the remaining firms. The former percentage was 82 and the latter little more than 50. Another point, which will not cause surprise, is that a smaller percentage of the small firms were corporations than of the large firms, as was found to be the case with joint-stock concerns in England.

It will be observed that the majority of the firms spinning only are found in Pennsylvania, Rhode Island, and Massachusetts. District localisation of this branch is found at Woonsocket (Rhode Island) and Philadelphia.

In Canada there are only 8 particularising spinning firms.

Section B.—*Weaving.*

Tables XX, XXI and XXII in the Appendix contain the available statistics for the British Isles and the United States. Table XX relates to 332 particularising firms out of a total of 430 firms weaving exclusively in the Yorkshire area. As in the case of spinning, almost every firm in the American Directory gives particulars.

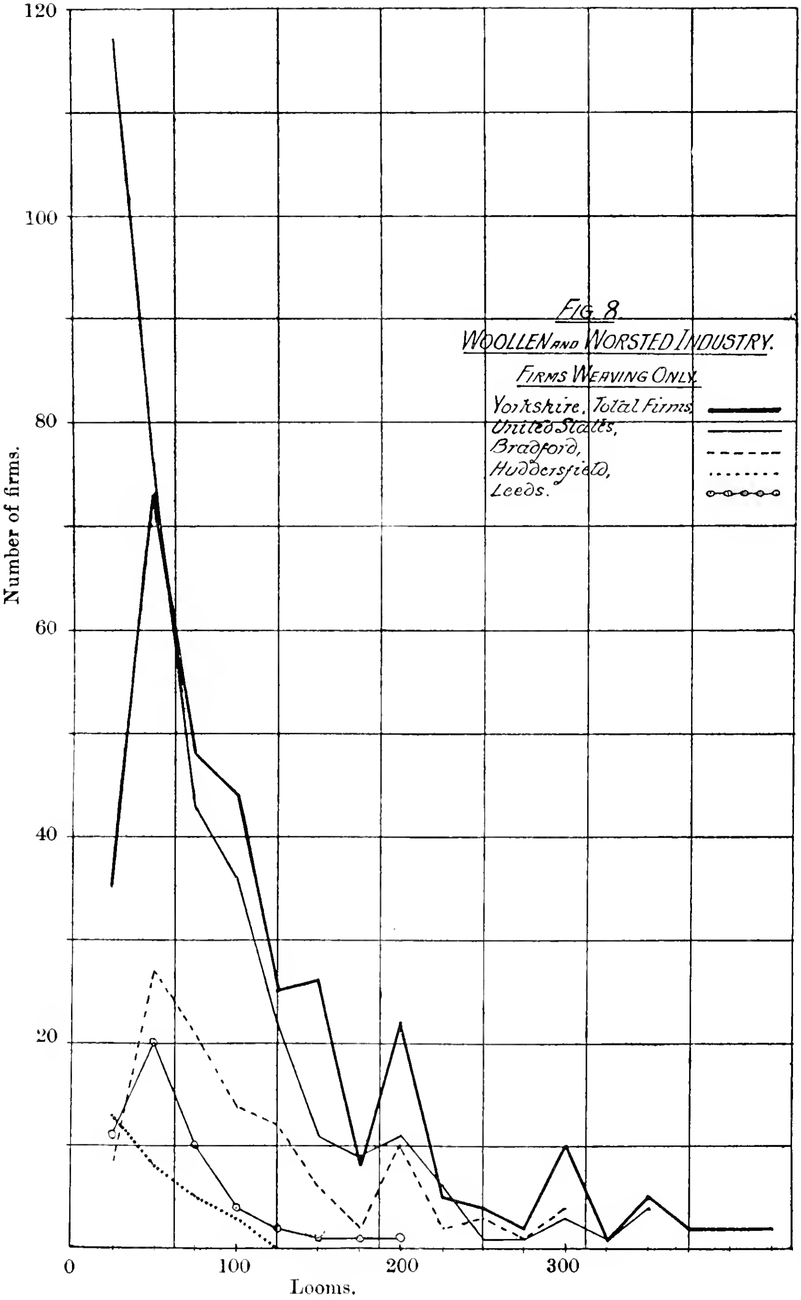


FIG. 8.
WOOLLEN AND WORSTED INDUSTRY.
FIRMS WEAVING ONLY.

Glancing at Fig. 8, we may notice first the graphs of totals for the United States and Yorkshire. Both obviously indicate uniformities. The only maximum for the United States is less than 25 looms seemingly, whereas the chief maximum for Yorkshire is 25–50 looms. Concentration in the West Riding may account for the larger type. Yorkshire has, in addition, a minor maximum of 175–200 looms, which seems to be just emerging in the United States. In the figure the graphs for Huddersfield (woollen weaving largely), Bradford (the chief centre of worsted) and Leeds are shown to aid in elucidating the complex form of the Yorkshire graph. The Huddersfield maximum is below 25 looms, and the chief one at Bradford and Leeds is 25–50. In Bradford we find in addition the 175–200 maximum noted above. As regards weaving outside Yorkshire, it may be added that it is almost all woollen. Hand-looms are still found in parts of Ireland, Scotland and Wales, often in firms which also make use of power-driven machinery.

As regards the United States, it is largely in Pennsylvania and Massachusetts, and in particular at Philadelphia, and to a less extent at Providence (Rhode Island), that weaving is separately organised. The firms which weave only are generally engaged in making carpets and rugs. This is particularly true of Pennsylvania, where 84 out of the 128 firms having 100 or fewer looms are producing carpets. Most of them are in Philadelphia.

As in spinning, so in weaving, in both the United States and England, companies are relatively commonest amongst the largest firms.

In Canada there are 30 particularising weaving firms. Of these, 24 have no more than 25 looms, and 14 no more than 5 looms.

Section C.—*Combined Spinning and Weaving.*

We may begin with some broad statements relating to the British Isles. The combined firm is mainly typical of the woollen branch of the industry; but the very large combined firms are almost entirely worsted firms. The proportion of the industry (reckoned in firms) worked by the combination method is shown below :—

Yorkshire woollen and worsted industry.

	Spinning.	Weaving.	Combined.	Total.
Bradford	65 30·4 per cent.	127 59·3 per cent.	22 10·3 per cent.	214
Halifax	22 48 per cent.	20 43·4 per cent.	4 8·6 per cent.	46
Huddersfield	42 30·4 per cent.	39 28·3 per cent.	57 41·3 per cent.	138
Leeds	17 9·3 per cent.	51 27·9 per cent.	115 62·8 per cent.	183
Other places	99 31·2 per cent.	95 30·0 per cent.	123 38·8 per cent.	317
Total	245 27·3 per cent.	332 36·9 per cent.	321 35·8 per cent.	898

In Bradford and Halifax, which are the seats of the worsted industry, a much smaller degree of integration is found than in the rest of the Yorkshire area. Among causes must be reckoned the external demand for worsted yarn for use abroad and in the hosiery industry at home, and the fact that the weaving of worsteds frequently requires a variety of yarns in the production of dress goods—silk and cotton are not unusually combined with worsted. In the case of firms producing woollen goods, there are equally strong reasons why the production of the yarn should be carried out under the supervision of the manufacturer.[12]

The following table shows the degree of integration in the woollen and worsted industry of the British Isles outside Yorkshire:—

Woollen and worsted industry of the British Isles (excluding Yorkshire).

	Spinning.	Weaving.	Combined.	Total.
England	8 15·0 per cent.	26 49·0 per cent.	19 36·0 per cent.	53
Ireland	2 5·1 per cent.	5 12·8 per cent.	32 82·1 per cent.	39
Scotland	22 18 per cent.	50 41·0 per cent.	50 41·0 per cent.	122
Wales	— —	4 7·0 per cent.	53 93·0 per cent.	57
Total	32 11·8 per cent.	85 31·3 per cent.	154 56·9 per cent.	271

Comparing the percentages for Yorkshire and the rest of the British Isles, we appear to have evidence for the belief that geo-

[12] See J. H. Clapham: *The Woollen and Worsted Industries*, p. 146, *et seq.*

graphical concentration makes for differentiation in the woollen and worsted industry, as well as in the cotton industry. It should be noticed, however, that very few of the firms outside Yorkshire are spinning or weaving worsteds, and this is certainly one reason for less differentiation.

In the table below the numbers of firms in Yorkshire with various quantities of spindles and looms are exhibited. It must be pointed out, however, that there are in addition 46 firms larger than those included. Their sizes range up to 800 in looms and over 80,000 in spindles, and one exceptional firm has 1,400 looms. The biggest of these great firms are for the most part in Bradford. There are also about 80 firms spinning and weaving of which no particulars are given.

Yorkshire. Woollen and worsted industry. Combined (spinning and weaving) firms.*

Spindles in thousands.

Looms.	1	2	3	4	5	6	7	8	9	10	11	Total
350–300	—	—	—	—	—	—	1	—	—	—	1	2
300–250	—	—	—	3	—	2	1	—	1	1	—	8
250–200	—	—	—	1	—	1	—	3	—	3	—	8
200–150	—	2	2	—	2	3	2	3	1	3	1	19
150–100	—	1	7	6	**9**	**9**	7	2	2	1	1	45
100–50	1	14	**34**	**29**	**18**	3	5	4	2	—	—	110
50–0	**19**	**40**	15	6	1	2	—	—	—	—	—	83
Total	20	57	58	45	30	20	16	12	6	8	3	275

* 46 large firms fall outside the limits of this table.

As in previous tables of a similar kind, the maximum of the vertical columns in the table above are printed black, while those of the horizontal columns are printed large, no maximum under 9 being noticed. The maximum number of firms has 1–50 looms and 1,000–2,000 spindles; and it would seem that the ratio of looms to spindles in a firm tends to $\frac{15}{600}$ or $\frac{15}{500}$.

In the British Isles outside Yorkshire there are 105 particularising firms with 1–50 looms and 1–1,000 spindles, 19 with 1–50 looms and 1,000–2,000 spindles, and no more than 4 of any other class. Concentration evidently makes for bigness as well as for differentiation.

In the United States, of particularising firms we find[13] :—

Spinning only	172	16 per cent.
Weaving ,, ...	350	33 ,,
Combined	532	51 ,,
	1,054	100 ,,

The percentages correspond more closely with those for the British Isles outside Yorkshire than for Yorkshire, and thereby afford support for the view that concentration aids differentiation.

The table below gives the sizes of the combined firms with the exception of 49 firms too big to fit in. Marking maxima

Woollen and worsted industry. United States. Combined (spinning and weaving) firms.*

Spindles in thousands.

Looms.	1	2	3	4	5	6	7	8	9	10	Total
350–300	—	—	—	—	—	—	—	—	1	—	1
300–250	—	—	—	—	1	—	1	—	1	—	3
250–200	—	—	1	1	2	2	1	1	1	1	10
200–150	2	—	2	5	3	1	1	1	—	—	15
150–100	1	4	**10**	4	4	5	8	5	5	2	48
100–50	4	16	**29**	**23**	**17**	**13**	4	5	2	1	114
50–0	**134**	**80**	**48**	23	4	2	—	—	—	1	292
Total	141	100	90	56	31	23	15	12	10	5	483

* 49 large firms fall outside the limits of this table.

as previously, we see that there is a tendency to a ratio between $\frac{1}{40}$ and $\frac{1}{60}$ which is not so far from the Yorkshire ratio of $\frac{1}{40}$ to $\frac{1}{33}$. We remark, however, that in the United States, where the industry is more scattered than in Yorkshire, a smaller firm predominates. Again, we seem to find inductive evidence for the view that concentration fosters size, though the extensive use of water power in the United States may be a contributory cause of the large number of small firms. Among the very big concerns in the United States the American Woollen Corporation is noteworthy. It controls 658,000 spindles and 9,675 looms; but, as its factories are scattered over different towns and States, they have not been reckoned as one firm.

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[13] A few "braiders" are mentioned in the Directory, but by no means so many as in the case of the cotton industry.

The results for the American industry lend support to the generalisations, derived from a study of the British industry, that the combined worsted firms tend to be on a larger scale than the combined woollen firms, and that there is a tendency for spinning and weaving to be organised in separate firms in the worsted industry and to be combined in the same firm in the woollen industry. Only 61 of the 532 combined firms recorded use any worsted machinery. Some of these 61 firms are very small, but they are not small on the whole, and they include nearly all the very large firms that were too big to be placed in the diagram of combined firms.

As in the case of the cotton industry, the tendency to the separation of processes is less strongly developed in the United States than in this country. Not only is this true of spinning and weaving, but also of the earlier and later processes of the industry. In this country combing is usually organised in separate firms, but in the United States only 12 firms combing exclusively exist. Similarly the dyeing and finishing processes are more often combined with spinning and weaving than in the Yorkshire industry. These facts may help to explain the apparently smaller size of the American firm when spindles and looms are taken as the index of size.

In Canada we find among particularising firms :—

Spinning only	8	7 per cent.
Weaving ,, ...	30	25 ,,
Combined	81	68 ,,
	119	100 ,,

The percentages are further from the Yorkshire extreme even than the American figures, which is doubtless to be explained by the industrial youth of Canada combined with the scattered state of the industry. Moreover, of the 81 combined firms most are excessively small: 23 have 1–5 looms only, and 1–250 spindles, and 44 have spindles not exceeding 500 and looms not exceeding 10.

PART III.—MISCELLANEOUS TEXTILE AND NON-TEXTILE INDUSTRIES.

Section A.—*Silk, Flax, Linen and Jute.*

In the British Isles the number of silk firms furnishing particulars is too small to generalise from. There are 24 in all, of which 13 are engaged in spinning only, 10 in weaving only, and 1 is combined. In the United States, however, conditions are different. There we find 730 out of about 840 furnishing particulars namely :—

Spinning only	158 firms.
Weaving "	518 "
Spinning and weaving	54 "
	730 "

Details will be found in Tables XXIII and XXIV in the Appendix. No uniformity as regards sizes of firms appears in silk spinning (except when they are put in units of 2,000), but in silk weaving it is unmistakable. There are most firms with no more than 50 looms—with no more than 25 as a matter of fact—and for the larger sizes, in units of 50, numbers steadily descend.

As regards flax, linen and jute for the British Isles, 227 firms give information out of 376. They are grouped as follows :—

Flax, linen and jute industry.

	England.		Ireland.		Scotland.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Spinning	4	28	28	23·1	24	26·1	56	24·7
Weaving	7	51	79	65·3	51	55·4	137	60·4
Combined	3	21	14	11·6	17	18·5	34	14·9
Total	14	100	121	100	92	100	227	100

Details of the spinning firms are shown in Table XXV. A broad uniformity as regards size is just suggested, particularly when account is taken of the fact that the firm tends to be larger in Ireland, where linen predominates, than in Scotland, where jute is of importance. Details as regards weaving are shown in Table XXVI. Again, the prevalence of types and a not irregular dispersion about them cannot fail to meet the eye, together with the tendency to larger magnitudes in Ireland.

Section B.—*Coal, Coking, Pig-Iron and Iron-Foundry Industries.*

In order to ascertain whether other industries exhibit similar tendencies to those prevailing in the group of textile industries already dealt with, particulars were abstracted from Ryland's Directory, for certain branches of the coal and iron industries. The results will be found in Tables XXVII, XXVIII, XXIX and XXX in the Appendix.

The first of these tables refers to the coal-mining industry in the British Isles. The figures refer to 1,784 out of 1,835 businesses. The word "business" is, however, used in a somewhat different sense from that given to it in our consideration of the textile industries. For reasons of convenience, a business in the case of the coal industry means the productive power in any one district under the control of one industrial manager. Very many colliery companies own pits in various parts of the country. Again, many companies have a number of pits in the same area, each of which is controlled by a colliery manager. Occasionally one manager controls pits in two or more areas (the areas are much smaller than those adopted in the textile directories), and in these cases the concern is split up in our figures into as many businesses as there were areas. But such conditions were rare in 1912, and will probably have disappeared altogether under the operation of the recent Mines Regulation Act. The index of size adopted is the number of men employed.

One prominent feature of the figures is the large number of very small businesses. While as many as 550 of the 1,784 businesses employ less than 101 men each, 212 have fewer even than 26 men. This is largely owing to the prevalence of "drifts" or "dip-workings," which are conveniently worked by a collier who possesses a little capital and is able to gather around him a small number of partners or employees. There is a sudden drop from the 100 men maximum (taking 100 men as the unit) to the 200 men point, and thereafter a fairly steady fall. It scarcely needs remark that these figures are in large part an index of geological conditions.

Table XXVIII refers to coke-making firms in the British Isles. The unit of measurement is the number of coke ovens possessed by each firm.

The normal firm appears to employ about 40 or 50 coke ovens, and the size distribution of firms about this maximum is fairly regular in a lopsided way. The table refers to 139 out of 201 firms in the Directory.

In Table XXIX the figures for producers of pig-iron are displayed, the unit of size being the number of blast furnaces used. All of the 107 firms registered in the Directory give particulars as to the number of blast furnaces. The maximum is at 2 blast furnaces, and the distribution about this is quite regular though one-sided. Businesses owning blast-furnaces may, of course, be possessed of other plant in addition, such as converters and roller-mills.

Table XXX refers to iron foundries. Out of a total of 2,065 firms, 1,205 give particulars as to the number of men employed.

The maximum number of firms employ between 6 and 10 men apiece. The distribution about this maximum is somewhat obscured by the changes in the unit of measurement. But the fall from the maximum as the number of men increases is perfectly obvious. It is important to state, though it will have been inferred, that the figures cover railway companies and many hardware firms of which the iron foundry is merely a small and almost incidental branch. The figures in Table XXX, as those in Table XXIX, measure to a considerable but unknown extent the sizes of sections of businesses only.

PART IV.—GENERAL CONCLUSIONS AND EXPLANATIONS.

Finally, two questions confront us. The one is, what in general has been established? The other is, what is the explanation of the facts established? First, we address ourselves to the question of the facts established.

Apart from the changes that have taken place in the last quarter of a century (examination of which has been confined to the Lancashire cotton industry), the general facts established may be taken as twofold. On the one hand, we may generalise as to the existence of typical or representative firms; on the other hand, some conclusions would seem to be warranted as to the dispersion of firms of different dimensions and forms about these types.

Generally speaking, there would seem to exist in industries, or branches of industries, of adequate size, under given sets of conditions, typical or representative magnitudes to which businesses tend to grow, typical proportions between their parts and typical constitutions. The number of spindles possessed by an exclusively spinning firm, the proportion of spindles to looms in a combined firm, and even their absolute numbers, the form of government originally, whether autocracy, oligarchy or elected directorate, all would seem to be subject more or less to law analogous to natural law. Indeed the growth of a business and the volume and form which it ultimately assumes are apparently determined in somewhat the same fashion as the development of an organism in the animal or vegetable world. As there is a normal size and form for a man, so, but less markedly, are there normal sizes and forms for businesses. Many variations about the human type are to be found, according to variations in antecedents and environment and in those unknown causes which for the sake of convenience are termed chance. But a type will emerge in any given place or time which results from the fundamental facts of our nature. Roughly, a similar uniformity may be expected in the industrial world, according to the showing of our analysis of facts, though more and greater variations are to be found than in the case of individuals. Men do not compete with each other for inches of stature as they do for business orders, and the modern business concern is extremely sensitive to variations in external conditions. It is true that the business type is sometimes blurred and frequently unpronounced when it is sought through statistics, while, as a rule, a simple reading of the figures reveals for each industry more than one type. But, as has been pointed out, an industry is in most cases more than one industry, so far as the fundamental character of its constituent businesses goes. When it is possible to isolate a comparatively homogeneous section, as it is when district specialism or specialism marked by a special type of organisation (*e.g.*, joint-stock initiative) has taken place, the figures always present themselves in a less complex grouping; though the possibility still remains sometimes of there being rival types. Again, our statistics record survivals in a world in which types are changing rapidly; whereas the anthropometric facts of living people may be regarded as containing no survivals, since the span of life is short and the human being alters in type only very slowly. In one industry in one place, dealt with above, there were no survivals to speak of, namely, in the cotton industry of the Southern States of America, and in this case a remarkable dominance of a single type was discovered; but it is to be remarked that in this case limited supplies of labour prevented off-shoots of a business from springing up in its neighbourhood, and thus put a check on business expansion and resulted in the figures relating more than is usual to the magnitude of factories.

Another point to be singled out, which has already been noted incidentally, is that as the animal type varies with environment so does the business type. The character of the people engaging in the industry, its geographical surroundings (including water supply for power) and its general economic setting (including the degree of development of commercial functioning) all seem to contribute to the moulding of the type. Our figures show local diversities of type, and a glance beneath them soon suggests the incidents enumerated as probable causes. Another cause of these diversities, which has already been commented upon, consists in differences in the ages of industries. Other probable causes are the dimensions of the industry and the degree of its concentration in a given place. There are indications that the larger and the more concentrated an industry is in a given place the larger and the more specialised, at any rate within limits, become its types.

Finally, in summarily reviewing the evidence, the fact that we have usually taken as the measurement of a business the amount of its fixed capital of a given kind is to be remarked, and consequently that the magnitude of the types revealed probably depends upon available supplies of capital: the proportion between labour and capital in a given industry is by no means constant geographically.

So much may be said as regards the evidence for typical or representative firms. But the analogy between living organisms and business organisms may be carried yet further. About each type of the former there is a regular dispersion of variations, broadly representable, when the variations are taken in any given respect (say, in respect of height), by a curve of error. Similarly, about each type of the latter there is a dispersion of variations which, so far as the variations are measurable, does not appear to be wholly or mainly sporadic. Of the nature of this dispersion it is not possible to speak with certainty, in consequence of the many defects of our figures, already deplored—for instance, that each set of figures relates, as a rule, to different classes of businesses and businesses of different ages. In some cases, as regards size, a curve is suggested which is not widely different from a curve of error; while in other cases the curve (if sufficient unbrokenness for the graph to be called a curve may be assumed) is of a more lopsided character, the spread-out relating to dimensions in excess of the type. On this lopsidedness some comments will be made later. At this stage we may leave the matter of dispersion with a repetition of the judgment that it seems to embody an appreciable or substantial degree of regularity in each case, even in the cases in which variations may take more than one direction, as they can, for instance, when they relate to firms which both spin and weave.

Turning to explanations as regards magnitude, the first point to notice is the extent to which the typical size of the business is settled by the forces governing the dimensions of the factory which yields the greatest mechanical efficiency. In the cotton industry in some parts of the world, for instance, the necessary power is still obtained largely from streams, and it may well be that the extent of many establishments is determined by the amount of power available. It appears to be true that this limitation connected with the provision of power applies not merely to the industry dependent on water for motive power, but also to industry in its most highly developed and modernised form. There appears to be, in Professor Macgregor's words, "a determinate mechanical unit of maximum efficiency."[14]

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[14] "Industrial Combination."

The limitation to the growth of a factory comes not merely from the maximum workable size of engines, but also from the difficulty of satisfactorily transmitting power over considerable distances. There is wastage in the friction connected with the shafting and belting and gearing of works: the efficiency of a plant may actually be reduced some 20 to 40 per cent. by reason of this. In the case of electric power, transmission is less subject to leakage, but even here the loss may be substantial. Again, there are other limiting causes, such as the difficulty of lighting rooms between decks, and the inconvenience of the remoteness of the storeroom, though such difficulties can be reduced by careful arrangement and planning. Moreover, it is to be borne in mind that it might not prove profitable to use some special machine till the business was large, and that the economies arising from the use of this machine could only be retained for a larger business if it were twice as large.[15] But, whatever the main causes, it is pretty certain that, as a rule, there is an objective limit, so to speak, to the growth of a factory under any given scheme of organisation.

Now this objective limit, granting its existence, does not, influential as it is, restrain rigidly the growth of firms. On the one hand, many firms may, and do, occupy more than one factory —and economies may result in consequence—while, on the other hand, in certain industries many firms may be working within the walls of the same factory. This is true not only of the cotton industry, but also of the woollen, lace, cutlery and other industries. The objective unit of maximum efficiency does not necessarily coincide with the subjective unit of maximum efficiency to be dealt with next.[16]

The subjective unit of maximum efficiency, as it might be termed, is the unit which would be brought about by personal forces working within a given environment of objective conditions, when the latter are supposed to impose no limit of themselves. A straitened supply of initiating, organising and directing ability, for instance, is bound at some point to evoke decreasing returns in a business; as in an organism the brain may be too small to make the most of a complex body. And when the dimensions of a business expand it is to be observed that its complexity tends to be augmented. Delegation and sectionalising of responsibility can effect much in some trades, but difficulty is felt sooner or later with respect to the cohesion of the sectionalised parts. The preservation of unity, combined with a high level of vitality, is the crux of the situation. Hence the tendency to increasing returns, which marks the early stages of the growth of a firm (in consequence of the economies of division of labour and machinery and of the use of machinery for which a large scale of production alone provides sufficient work), gradually disappears and decreasing returns assert themselves instead. This tendency to decreasing returns appears earlier or later according to the nature of the industry. Of course, at the position of equilibrium decreasing returns must be ruling at the margin of every business.[17] Finally, in connection with the subjective determination of the magnitude of a business, it remains to call to mind that it tends to produce in each industry, or section of an industry, not a fixed size, as the objective determination does, but various sizes, corresponding to the various degrees of human capacity, grouped about a type or types.

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[15] See footnote on p. 300 of vol. lxxv of this *Journal.*

[16] In talking of "maximum efficiency" above, we mean, of course, a maximum when allowance is made for cost.

Much of the peculiarity in the statistics of the dimensions of businesses in a given industrial field is due to the divergent pulls of subjective and objective forces. The objective are bound to prevail, for reasons of economy, in most cases when the subjective would occasion a size not very much greater or less than the size which would be created by the objective. Herein we perceive one reason for the domination of types; for the vast majority of firms are housed in one building. But the subjective prevail, though again within limits set by the objective, when they are strong enough to bring about reduplication of buildings and plant, or the attachment of allied processes—modifications, it must be remembered, which may not be apparent to the untrained eye since a unity of external form may be preserved. Herein we see one reason—other reasons will be dealt with later—for the not uncommon lopsidedness in the dispersion of business magnitudes; for, in many industries, while reduplication or supplementing of the productive unit under one head is feasible, its division or shrinkage could only be achieved at serious loss. However, in the cases in which the objectively governed unit is so small that the typical firm will contain many such units, and in the cases in which the economies of a large unit for power-production can be combined with a small unit for the management of manufacture apart from power-production, as in the "room and power" system, we should expect to find a less one-sided dispersion curve. A comparison of the graphs for cotton spinning and weaving respectively in the diagrams above will suggest that this expectation is not invariably disappointed; and, indeed, in the figures and tables there is further evidence to indicate that the expectation is well-founded.

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[17] These decreasing returns, which help to fix the position of equilibrium, are what are experienced when the size of the industry and environmental economies are taken as constant. (See review of Irving Fisher's "Elements of Economics" in vol. lxxvi, p. 121, of the *Journal*.)

Bearing in mind the importance of the objective forces, to which reference will not be made again, we may now bring out, as briefly as possible, the salient features of the various possible explanations of our results as regards the dimensions of businesses, recapitulating certain points in the foregoing discussion and adding others.

In the first place, we have to remember that firms may grow up from small beginnings (some never reaching maturity), and that these small beginnings and the growing stages are included in the figures. As a rule firms do not correspondingly grow down when they get old. When a firm decays its degeneration is marked by a high cost of production, and it may then be taken over as a whole by a new firm (possibly by a company), or its buildings and plant may pass piecemeal into other hands. The facts of growth no doubt help to account for the crowd of relatively small firms and the very few enormous ones; but they will not alone account for all the features of the graphs.[18] If our graphs merely reflect the age-distribution of businesses, so to say, they ought invariably to descend steadily from the left, instead of ascending first as they frequently do. If, however, we suppose that though, as a rule, a new firm is established of a certain typical magnitude, to insure economy in production, certain would-be employers, who cannot find means to make a start without a handicap, are satisfied with smaller beginnings, then the lopsidedness of our curves and the precipitousness on two sides of our surfaces for "combined" firms could be explained by the operations of growth.

Leaving the question of age-distribution, we might suppose that the capacity of the business control (whether it resided in an individual, a group of partners, or a board of directors) was the outstanding determinant of the size of a firm, and argue, therefore, that the dispersion of business magnitudes is an index of the dispersion of capacity for business control. If we took this line, the statistics put forward would certainly not reveal the altogether unexpected. For capacity of the kind in question might very well be distributed according to the law of error, and, as a moderate degree of this capacity would be needed for any success in business at all, a graph showing the outcome of this capacity in the scale of business establishments would be sheared off on the left in all probability, while a surface similarly indicative would be sheared off at the bottom and on the left. Where there is a higher as well as a lower type, such lack of balance, or an equal degree of lack of balance, is less likely to appear in the case of the higher type; for small success at the higher type may mean nevertheless a fair income, though small success at the lower type, marking the place where beginners at employing are struggling in, might mean no income at all or even loss, under the stress of competition among a crowd for most of whom there was no room. From the diagrams, and the tables relating to combined firms in the Lancashire cotton industry in 1911, one would judge that the lopsidedness of dispersion about the higher types is less marked; but in interpreting the curves and surfaces it must be remembered that the valley between two elevations is combined of the descent from the one and the ascent of the other, the end of the one and the beginning of the other overlapping. Here it may be remarked also that some degree of the lopsidedness of the arrangement revealed could be explained on the hypothesis that it is equal percentage variations, and not equal amounts of variation, about the typical size of business in either direction that are brought about by equal variations of capacity in either direction.

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[18] Hereafter, for the sake of simplicity, we shall sometimes speak of curves or graphs only, but when we do, our remarks must usually be taken as applying equally, in a general sense, to the surfaces indicated by the tables relating to "combined" firms. The size of a firm, indeed, might need to be represented as a function of more than two variables; but still the general tenor of our observations would apply.

Another possible explanation of our facts may be put in this way. Going to the very opposite extreme and for the time being arguing on a wholly inadmissible hypothesis, we might imagine that the capacities of employers are pretty much the same, but that some are more fortunate than others in hitting upon a business policy and mode of organisation which yield the most profitable results. More or less fortuitous circumstances operate as deterrents to the success of some of them, but inasmuch as they are all striving towards the same general end, consisting in economy of production combined with a volume of business, a graph or surface showing the results attained should on this hypothesis exhibit some regularity of form; and we might take it that the size of the firm is an index of attainment. According to this extreme way of looking at things, we may think of our employers and directors as so many marksmen, who are equally good shots, aiming at a target. The shots that enter the bull's-eye will be few, and the shots that miss the target will be few, but very many shots will be moderately good, so that a curve showing the degrees of departure of shots from the bull's-eye would probably be of the nature of a curve of error; and, again, its shearing off on the left would not be remarkable, since moderately and very lucky marksmen would alone remain uneliminated.

Yet another explanation, of quite a different order, is that the dimensions of businesses represent, on the whole, organic variations (as it may be metaphorically put) about certain types. It is arguable (1) that there is infinite variety about the nature of businesses in respect of the exact kind of output and the steadiness of the market served; and (2) that there is variety also in respect of the way in which businesses producing the same things for the same markets can be organised, so that one business may organise its factors in one way and another business in another way, and one may get a high profit per unit on a small output, and another a small profit per unit on a large output. According to this view a graph displaying the sizes of firms doing the same kind of business, even if each was of its maximum size and all employers were of equal capacity, might be of the general form of a curve of error, the maximum marking the most common arrangements and other points variations about this indicative of peculiarities in conditions or modifications in schemes of organisation.

The truth probably partakes of all these views. The dispersion of business magnitudes about types is to be explained in part by objective forces; in part by the growth of businesses; in part by the dispersion of capacity among industrial leaders and would-be industrial leaders (which one would imagine from the uniformity of nature to be of a regular kind). combined with the requirement of a high minimum of capacity: in part by the resistance of circumstances to people's efforts; and in part by variety in business and in methods of attaining any given end. But at least one thing is certain, namely, that the size of a business is determined appreciably by law and not wholly by chance. Chance operates, but only to the extent of modifying the results which an unimpeded operation of the determining forces would bring about. Thus, according to the extreme view which uses the analogy of lucky and unlucky marksmen, businesses in the same branch of the industry would all be of the same size but for chance, which is strong enough to spread out business magnitudes in a certain regular arrangement about a type or types, but is not strong enough to destroy regularity entirely and substitute for it haphazard dispersion. If the dominant influences were casual we should not have the comparatively regular graphs and surfaces shown or indicated above.

STATISTICAL APPENDIX.

Note.—In the following tables, the figures in the first column mean "up to and including" the stated number of spindles, looms, or other things referred to, as the case may be, and excluding all numbers up to the previous one stated. Thus, opposite 5,000 spindles, succeeding 2,500 spindles, is given the number of firms with any quantity of spindles from 2,501 to 5,000.

The proportions of the several industries to which the tables relate are stated in the text.

The meaning of the letters "P," "C" and "J" is stated on page 474 above.

TABLE I.—*Firms spinning only (distinguished by size, type and district) in the Lancashire and district cotton industry for the years* 1884 *and* 1911.

Spindles.	Number of firms.															
	Ashton.				Bolton.				Manchester.				Oldham.			
	1911.			1884.	1911.			1884.	1911.			1884.	1911.			1884.
	P.	J.	Total.	Total.	P.	J.	Total.	Total.	P.	J.	Total.	Total.	P.	J.	Total.	Total.
2,500	–	–	–	–	1	–	1	2	1	–	1	1	2	1	3	3
5,000	–	–	–	2	1	–	1	1	–	–	1	–	–	1	1	6
7,500	1	–	1	–	–	–	–	–	1	–	1	1	2	1	3	7
10,000	1	–	1	–	–	–	–	3	-	–	1	3	2	1	3	11
15,000	1	1	3	3	–	1	2	5	3	–	5	2	7	1	9	22
20,000	1	–	1	2	–	–	–	6	1	–	2	4	2	4	8	25
25,000	–	–	-	2	–	–	–	3	–	–	1	6	1	3	5	13
30,000	1	–	4	4	1	–	3	5	–	1	3	4	2	3	5	12
35,000	–	–	1	4	1	-	1	5	1	–	2	2	–	4	4	5
40,000	–	–	1	1	1	1	2	4	1	–	2	1	1	6	8	10
45,000	–	1	1	1	–	–	4	6	–	1	1	4	1	4	5	5
50,000	–	1	1	2	2	1	4	5	–	–	1	1	1	3	6	12
60,000	–	–	1	1	1	2	5	5	–	1	3	4	2	11	15	18
70,000	–	–	1	–	–	–	–	6	–	2	3	6	1	13	18	16
80,000	–	5	6	1	–	–	4	4	–	3	4	3	2	19	23	21
90,000	–	2	2	1	–	1	2	2	–	1	2	1	–	21	22	2
100,000	1	1	2	–	–	1	3	1	–	3	3	1	–	25	26	4
110,000	–	–	–	–	1	5	7	1	–	2	2	–	–	17	18	3
120,000	–	–	–	–	–	–	1	–	–	2	4	–	–	14	15	3
130,000	–	–	–	1	–	2	3	–	–	1	1	–	–	3	3	1
140,000	–	–	–	–	–	–	1	1	–	–	–	1	–	4	4	1
150,000	–	1	1	1	–	–	–	–	–	–	–	2	1	3	4	1
160,000	–	1	1	–	–	1	2	–	–	1	1	–	–	1	2	–
170,000	–	–	–	–	–	–	2	–	–	–	1	–	–	1	1	–
180,000	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
190,000	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–
200,000	–	–	–	–	–	1	3	–	–	–	1	–	–	–	–	–
210,000	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–
220,000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
230,000	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
240,000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
250,000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
260,000	–	–	–	–	1	–	1	1	–	–	–	–	–	–	–	–
*Over 260,000	–	–	–	–	–	3	4	1	–	–	1	–	–	–	–	–
Total	6	13	29	26	10	20	58	69	8	18	47	47	27	164	211	201

* The firms having more than 260,000 spindles each in 1911 are of the following sizes: 3 of 270,000 spindles each (1 in Bolton, 1 in Stockport and 1 elsewhere); 1 of 300,000 spindles (in Bolton); 1 of 320,000 spindles ("Elsewhere"); 1 of 340,000 ("Elsewhere"); 1 of 370,000 (in Bolton); 1 of 450,000 (in Manchester); and 1 of 460,000 (in Bolton). In 1884, 1 firm of 326,000 (in Manchester), and 1 of 420,000 ("Elsewhere"), were found.

The figures for firms of the C type (1911) can be obtained by subtracting the sum of the figures for P and J from the figures indicating total firms.

TABLE I *Contd.—Firms spinning only in the Lancashire cotton industry.*

Spindles.	Number of firms.																		
	Rochdale.				Stockport.				Elsewhere.				All districts.			All districts.		
	1911.			1884.	1911.			1884.	1911.			1884.	1911.			1884.		
	P.	J.	Total.	Total.	P.	J.	Total.	Total.	P.	J.	Total.	Total.	P.	J.	Total.	P.	J.	Total.
2,500	–	–	–	2	4	–	4	7	6	1	10	7	14	2	19	22	–	22
5,000	3	1	5	4	2	1	4	1	1	2	3	7	7	5	15	20	1	21
7,500	2	–	3	3	–	–	–	5	1	–	6	11	7	1	14	27	–	27
10,000	1	–	1	3	2	–	2	4	1	1	7	9	7	2	15	31	1	33
15,000	1	4	8	8	2	2	4	6	3	4	11	31	17	13	42	66	9	77
20,000	–	5	6	6	2	2	5	8	6	3	11	26	12	14	33	71	3	77
25,000	–	4	5	4	1	–	1	2	3	8	14	21	5	15	26	44	6	51
30,000	–	4	4	5	1	2	4	4	2	13	18	12	7	23	41	36	9	46
35,000	1	–	1	1	–	–	1	4	1	8	9	11	4	12	19	28	3	32
40,000	–	1	1	–	–	1	1	1	1	1	6	11	4	10	21	18	8	28
45,000	–	–	–	–	–	–	–	–	1	5	10	15	2	11	21	21	7	31
50,000	–	2	2	–	–	–	1	–	–	7	8	7	3	14	23	19	6	27
60,000	–	1	1	1	–	–	1	–	–	10	13	12	3	25	39	24	15	41
70,000	–	2	2	1	–	1	1	1	–	7	11	9	1	25	36	23	16	39
80,000	1	4	5	2	–	–	1	–	–	8	11	4	3	39	54	16	18	35
90,000	–	3	3	–	–	–	–	–	3	9	13	4	3	37	44	6	4	10
100,000	–	6	6	–	–	–	1	1	1	15	17	–	2	51	58	1	4	7
110,000	–	3	3	–	–	–	1	1	–	5	5	4	1	32	36	5	4	9
120,000	–	3	3	–	–	1	1	2	–	6	6	1	–	26	80	4	3	6
130,000	–	1	1	–	–	1	1	–	–	4	4	–	–	12	13	–	2	2
140,000	–	–	–	–	–	2	2	1	–	1	2	–	–	7	9	8	–	4
150,000	–	–	–	–	–	–	–	–	–	–	–	1	1	4	5	2	–	5
160,000	–	–	–	–	–	–	–	–	–	2	2	1	–	6	8	2	–	1
170,000	–	1	1	–	–	1	1	–	–	2	2	–	–	5	8	–	–	–
180,000	–	–	–	–	–	–	–	–	–	1	1	1	–	1	2	1	1	2
190,000	–	–	–	–	–	1	1	–	–	1	1	–	–	2	2	1	–	2
200,000	–	–	–	–	–	1	1	–	–	–	–	1	–	2	5	–	–	–
210,000	–	–	–	–	–	–	–	–	–	1	2	–	–	2	3	–	–	–
220,000	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–
230,000	–	–	–	–	–	–	–	–	–	1	2	1	–	1	3	1	–	1
240,000	–	–	–	–	–	–	–	–	–	1	1	–	–	1	1	–	–	–
250,000	–	–	–	–	–	–	–	–	–	1	1	–	–	1	1	–	–	–
260,000	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	1	–	1
*Over 260,000	–	–	–	–	–	1	1	–	–	3	3	1	–	7	9	1	–	2
Total	9	45	61	40	14	17	40	48	30	131	211	208	104	408	657	494	120	639

* See note on previous page.

TABLE II.—*Lancashire Cotton Industry*, 1911. *Number of firms spinning only in each district of the* P (*private and partnership*), C (*limited company other than* J) *and* J (*joint-stock in origin*) *form.*

	Number of firms.			Percentage.		
	P.	C.	J.	P.	C.	J.
Ashton	6	10	13	20·7	34·4	44·9
Bolton	10	28	20	17·2	48·3	34·5
Manchester	8	21	18	17·0	44·7	38·3
Oldham	27	20	164	12·8	9·5	77·7
Rochdale	9	7	45	14·8	11·5	73·7
Stockport	14	9	17	35·0	22·5	42·5
Elsewhere	30	50	131	14·2	23·7	62·1
Total	104	145	408	15·9	22·1	62·0
	657			100		

TABLE III.—*Sizes of firms doubling only in the Lancashire Cotton Industry*, 1911.

Spindles.	Number of firms.			Spindles.	Number of firms.		
	P.	C. and J.	Total.		P.	C. and J.	Total.
2,500	5	3	8	25,000	2	1	3
5,000	1	1	2	30,000	—	4	4
7,500	3	1	4	35,000	1	1	2
10,000	2	1	3	Over 35,000	—	2	2
15,000	14	4	18				
20,000	5	5	10	Total	33	23	56

TABLE IV.—*Number, sizes and types of cotton-spinning firms in the British Isles, outside the Lancashire district, in* 1911.

	Number of firms.					
	Yorkshire.		Elsewhere.		Total Yorks.	Grand Total.
	P.	C. and J.	P.	C. and J.		
2,500	1	1	4	1	2	7
5,000	16	3	3	—	19	22
7,500	3	—	2	—	3	5
10,000	10	1	1	1	11	13
15,000	9	7	—	3	16	19
20,000	3	3	—	1	6	7
25,000	1	6	—	1	7	8
30,000	2	4	—	1	6	7
35,000	—	1	2	2	1	5
40,000	3	4	—	1	7	8
45,000	3	2	—	—	5	5
50,000	2	3	—	1	5	6
60,000	2	2	—	1	4	5
70,000	—	2	—	1	2	3
80,000	—	2	—	3	2	5
90,000	2	—	—	—	2	2
100,000	—	1	—	1	1	2
Over 100,000	—	2	—	4	2	6
Total	57	44	12	22	101	135

TABLE V.—*Sizes of firms exclusively spinning cotton-yarn in the United States of America.*

Spindles.	Number of firms.														
	Mainly Northern States.														
	Me.	N.H.	Mass.	R.I.	Conn.	N.Y.	Pa.	N.J.	Md.	Wis.	O.	Ill.	Ind.	Mo.	All N. States.
2,500	–	–	5	2	2	5	5	3	–	–	–	2	–	–	24
5,000	1	1	6	3	6	–	3	1	–	1	–	–	1	1	24
7,500	2	–	4	5	1	1	2	–	–	–	–	–	–	–	15
10,000	–	–	6	4	–	3	1	–	1	–	–	–	–	–	15
15,000	–	–	2	4	–	2	4	–	–	–	1	–	–	–	13
20,000	1	1	–	1	3	5	4	–	–	–	–	–	–	–	15
25,000	–	–	3	–	–	1	–	–	–	–	–	–	–	–	4
30,000	–	–	2	1	–	–	1	–	–	–	–	–	–	–	4
35,000	–	–	–	2	1	1	–	–	–	–	–	–	–	–	4
40,000	–	–	–	2	–	–	–	2	–	–	–	–	–	–	4
45,000	–	–	1	1	–	–	1	–	–	–	–	–	–	–	3
50,000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
60,000	–	–	3	–	–	1	–	–	–	–	–	–	–	–	4
70,000	–	–	5	1	–	–	–	–	–	–	–	–	–	–	6
80,000	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1
90,000	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1
100,000	–	–	2	1	–	–	–	–	–	–	–	–	–	–	3
110,000	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1
120,000	–	–	1	–	1	–	–	–	–	–	–	–	–	–	2
Over 120,000	–	–	2	–	–	–	–	1	–	–	–	–	–	–	3
Total	4	2	43	28	14	19	21	8	1	1	1	2	1	1	146

TABLE V *Contd.—Sizes of firms exclusively spinning cotton-yarn in the United States of America.*

Spindles.	Number of firms.													
	Southern States.													
	Ala.	Ga.	Ky.	Miss.	N.C.	S.C.	Tenn.	Va.	Ark.	La.	Okla.	Tex.	All S. States.	Total U.S.A.
2,500	3	5	–	2	12	1	2	–	–	–	–	–	25	49
5,000	8	16	3	1	32	5	3	1	–	2	–	2	73	97
7,500	6	8	1	1	36	10	1	1	1	–	1	1	67	82
10,000	4	5	–	1	38	3	–	1	–	–	–	–	52	67
15,000	3	14	–	–	28	3	3	–	–	–	–	–	51	64
20,000	2	2	–	–	14	1	–	–	–	–	–	–	19	34
25,000	–	3	–	–	2	3	–	–	–	–	–	–	8	12
30,000	1	1	–	–	2	2	1	–	–	–	–	–	7	11
35,000	–	1	1	–	1	1	–	–	–	–	–	–	4	8
40,000	1	–	–	–	–	–	–	–	–	–	–	–	1	5
45,000	1	–	–	–	1	–	–	–	–	–	–	–	2	5
50,000	–	–	–	–	–	–	–	–	–	–	–	–	–	–
60,000	–	–	–	–	–	–	–	–	–	–	–	–	–	4
70,000	–	1	–	–	–	–	–	–	–	–	–	–	1	7
80,000	–	–	–	–	–	–	–	–	–	–	–	–	–	1
90,000	–	–	–	–	1	–	–	–	–	–	–	–	1	2
100,000	–	–	–	–	–	–	–	–	–	–	–	–	–	3
110,000	–	–	–	–	–	–	–	–	–	–	–	–	–	1
120,000	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Over 120,000	–	–	–	–	–	–	–	–	–	–	–	–	–	3
Total	29	56	5	5	167	29	10	3	1	2	1	3	311	457

TABLE VI.—*Cotton Industry. Sizes of firms spinning only in countries of Continental Europe.*

Spindles.	Number of firms.											
	Austria.	Belgium.	Denmark.	France.	Germany.	Holland.	Norway.	Russia.	Spain.	Sweden.	Switzerland.	Europe. All countries.
2,500	2	—	—	—	17	—	—	3	3	1	6	32
5,000	1	—	—	6	20	—	1	4	5	—	7	44
7,500	—	—	—	3	29	—	—	4	11	—	5	52
10,000	1	4	—	9	27	—	—	7	11	1	6	66
15,000	5	5	—	6	41	—	—	1	2	2	9	74
20,000	5	5	—	10	30	—	—	3	4	1	4	62
25,000	6	3	—	6	32	1	—	6	4	1	1	60
30,000	5	1	—	12	25	1	—	6	1	1	2	54
35,000	1	3	1	4	11	—	—	2	1	—	—	23
40,000	3	3	—	8	15	—	—	3	1	—	—	33
45,000	3	1	—	2	12	—	—	4	—	—	—	22
50,000	1	—	—	1	10	—	—	1	1	—	1	15
60,000	4	4	—	5	13	1	—	4	—	—	2	33
70,000	—	—	1	3	4	1	—	2	—	—	—	11
80,000	5	1	—	5	6	—	—	3	—	—	—	20
90,000	—	—	—	1	3	—	—	1	—	—	—	5
100,000	—	1	—	1	3	—	—	1	—	—	1	7
110,000	—	—	—	—	2	—	—	1	—	—	—	3
120,000	1	1	—	—	—	—	—	2	—	—	—	4
130,000	1	—	—	1	1	—	—	2	—	—	—	5
140,000	—	—	—	—	2	—	—	1	—	—	—	3
150,000	—	—	—	—	—	—	—		—	—	—	—
Over 150,000	1	—	—	—	5	—	—	4	—	—	—	10
Total	45	32	2	83	308	4	1	68	44	7	44	638

TABLE VII.—*Cotton Industry. Sizes of firms spinning only in India, China and Japan.*

Spindles.	Number of firms.		
	India and Ceylon.	China.	Japan.
2,500	1	—	4
5,000	—	—	5
7,500	2	—	1
10,000	2	4	1
15,000	14	5	5
20,000	17	2	1
25,000	8	1	1
30,000	7	—	—
35,000	7	1	2
40,000	9	2	—
45,000	5	2	—
50,000	8	—	—
60,000	2	1	2
70,000	1	1	1
80,000	1	—	—
90,000	—	1	—
100,000	—	—	—
110,000	—	—	—
120,000	—	—	—
130,000	—	—	1
140,000	—	—	1
150,000	—	—	—
160,000	—	—	1
Total	84	20	26

TABLE VIII.—*Sizes of firms weaving only in the Lancashire cotton industry for the year* 1911.*

Looms.	Number of firms.														
	Accrington.			Blackburn.			Bolton.			Burnley.			Chorley.		
	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.
— 25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
— 50	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–
— 75	–	–	2	–	–	–	–	–	–	2	–	2	–	–	–
— 100	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–
— 150	–	–	–	–	–	–	–	–	1	4	–	6	1	–	1
— 200	–	–	–	–	–	–	–	–	–	5	1	7	–	–	–
— 250	–	1	1		–	–	–	–	2	2	1	3	–	–	–
— 300	–	1	1	2		4	1	2	3	–	–	2	1	–	1
— 350	–	–	–	1	1	4	1	–	2	–	1	1	3	–	3
— 400	–	–	3	1	2	5		–	1	–	–	4	1	–	1
— 450	1	2	7	2	1	6	–	1	1	4	1	8	–	–	–
— 500	–	–	–	2	2	5	–	–	–	5	3	10	–	–	–
— 600	3	4	8	3	6	15	1	1	4	4	3	11	1	2	4
— 700	2	2	4	2	2	6	–	–	2	1	3	6	–	1	2
— 800	2	–	2	5	2	8	–	1	1	5	1	7	–	2	3
— 900	1	–	1	2	1	5	–	1	1	3	–	5	–	–	–
—1,000	2	1	3	1	1	5	–	–	–	3	3	8	–	–	–
—1,100	1	1	3	5	2	9	–	–	–	3	2	7	–	–	–
—1,200	–	–		–	–	–	–	–	2	4	–	4	1	–	2
—1,300	–	1	1	1	–	1	–	–	–	1	2	6	–	–	–
—1,400	–	–	–	–	2	2	–	–	–	–	–	1	1	–	1
—1,500	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–
—1,600	–	–	–	1	–	1	–	–	–	–	1	2	–	–	–
—1,700	–	–	–	–	–	–	–	–	–	–	–	2	1	–	1
—1,800	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
—1,900	1	–	2	–	1	1	–	–	–	1	–	1	–	–	–
—2,000	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–
—2,100	1	–	1	–	–	–	–	–	–	1	–	1	–	–	–
—2,200	–	–	–	–	1	1	–	–	–	–	1	1	–	–	–
—2,300	1	–	1	–	1	1	–	–	–	–	–	1	–	–	–
—2,400	–	–	–	1	–	1	–	–	–	–	–	2	–	–	–
—2,500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,700	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Total	15	13	40	29	26	81	4	6	21	52	23	115	10	5	19

* The figures for firms of the C type can be obtained by subtracting the sum of the figures for P and J from the figures indicating total firms.

TABLE VIII *Contd.—Sizes of firms weaving only.*

Looms.	Number of firms.														
	Colne.			Darwen.			Manchester.			Nelson.			Preston.		
	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.
— 25	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–
— 50	1	–	1	–	–	–	1	–	1	2	–	3	–	–	–
— 75	4	–	4	–	–	–	–	–	–	4	–	4	–	1	1
— 100	6	–	7	–	–	–	2	1	4	–	1	2	1	–	1
— 150	12	–	14	–	–	–	3	–	3	10	–	15	2	–	2
— 200	11	–	12	1	–	1	2	2	5	7	1	13	–	–	–
— 250	6	2	9	2	–	2	2	1	4	9	–	11	1	–	1
— 300	4	1	5	–	–	1	5	1	6	1	–	8	1	1	2
— 350	3	–	7	1	3	5	5	2	10	5	–	5	1	–	1
— 400	3	–	3	1	–	4	–	–	1	2	2	7	–	–	–
— 450	–	1	1	–	–	1	2	–	2	–	–	3	–	3	3
— 500	1	–	2	1	1	3	–	–	–	3	1	7	–	–	1
— 600	2	2	4	2	1	3	–	–	2	5	1	13	1	5	9
— 700	1	–	2	2	–	3	3	1	7	2	1	6	3	1	6
— 800	1	–	1	–	–	1	1	–	1	5	–	6	2	1	3
— 900	1	–	1	2	1	3	–	–	–	2	1	4	2	2	4
—1,000	–	–	1	2	–	2	–	–	–	2	–	5	–	–	1
—1,100	–	–	–	4	–	4	–	–	–	–	–	1	3	–	4
—1,200	–	–	–	1	–	3	–	–	–	–	–	–	2	–	2
—1,300	–	–	1	–	1	2	–	–	–	–	–	–	1	–	2
—1,400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—1,500	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
—1,600	–	–	–	1	–	2	–	–	–	1	–	2	–	–	1
—1,700	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—1,800	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–
—1,900	–	–	–	–	1	1	–	–	–	–	–	–	–	–	1
—2,000	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–
—2,100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,300	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,700	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
Total	56	6	75	21	8	42	26	8	46	62	8	119	20	14	45

TABLE VIII *Contd.—Sizes of firms weaving only.*

Looms.	Number of firms.														
	Radcliffe.			Rochdale.			Todmorden.			Elsewhere.			All places.		
	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.
— 25	–	–	–	–	–	–	–	–	–	1	–	1	2	–	2
— 50	4	–	4	1	–	1	1	–	1	1	–	1	15	–	16
— 75	2	–	2	2	–	3	–	–	–	2	–	2	16	1	20
— 100	4	–	4	1	–	1	1	–	1	5	3	8	21	5	29
— 150	6	3	10	1	1	3	4	–	6	6	–	7	49	4	68
— 200	4	2	9	2	–	2	2	–	3	2	–	4	36	6	56
— 250	4	–	5	–	–	–	1	–	1	5	1	9	32	6	48
— 300	1	–	1	2	1	4	1	–	2	3	4	15	22	11	55
— 350	–	–	–	–	–	1	1	–	2	8	1	14	29	8	55
— 400	–	–	1	–	–	–	2	–	2	8	6	19	18	10	51
— 450	–	–	1	–	1	2	–	1	2	5	3	8	14	14	45
— 500	–	–	–	–	–	–	–	–	2	2	–	3	14	7	33
— 600	–	–	–	1	1	3	3	–	4	3	8	14	29	34	94
— 700	–	1	1	–	–	–	3	–	3	3	3	9	22	15	57
— 800	–	–	1	–	1	1	–	–	–	2	4	6	23	12	41
— 900	–	–	1	–	–	–	–	–	–	–	6	7	13	12	32
—1,000	–	–	–	–	–	–	–	–	–	–	2	4	10	7	29
—1,100	1	–	1	–	–	–	–	–	–	2	4	6	19	9	35
—1,200	–	–	–	–	–	–	–	–	–	–	–	4	8	–	17
—1,300	–	–	–	–	–	–	–	–	–	–	2	2	3	6	15
—1,400	–	–	–	–	–	–	–	–	–	–	1	2	1	3	6
—1,500	–	–	–	–	1	1	–	–	–	–	2	2	–	3	6
—1,600	–	–	–	–	–	–	–	–	–	–	–	–	3	1	8
—1,700	–	–	–	–	–	–	–	–	–	–	3	4	1	3	7
—1,800	–	–	–	–	–	1	–	–	1	–	–	–	1	–	4
—1,900	–	–	–	–	–	–	–	–	–	1	–	1	3	2	7
—2,000	–	–	1	–	–	–	–	–	–	1	–	2	2	1	5
—2,100	–	–	–	–	–	–	–	–	–	–	1	2	2	1	4
—2,200	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2
—2,300	–	–	–	–	–	–	–	–	–	–	–	–	1	1	3
—2,400	–	–	–	–	–	–	–	–	–	–	–	–	1	–	3
—2,500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
—2,700	–	–	–	–	–	–	–	–	–	–	–	1	–	–	2
Total	26	6	42	10	6	23	19	1	30	60	54	157	410	184	855

TABLE IX.—*Sizes of firms weaving only in the Lancashire Cotton Industry for the year* 1884.*

Looms.	Number of firms.														
	Accrington.			Blackburn.			Bolton.			Burnley.†			Chorley.		
	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.
25	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–
50	–	–	–	–	–	–	3	–	3	2	–	2	–	–	–
75	–	–	–	–	–	–	3	–	3	2	–	2	–	–	–
100	–	–	–	–	–	–	–	–	–	4	–	4	–	–	–
150	–	–	–	1	–	1	–	–	–	14	–	14	1	–	1
200	–	–	–	2	–	2	–	–	–	6	–	6	–	–	–
250	1	–	1	–	–	–	2	–	2	14	–	14	3	–	3
300	2	–	2	10	–	10	–	–	–	9	–	9	–	–	–
350	1	1	2	2	–	2	2	–	2	11	2	13	2	–	2
400	3	–	3	2	–	2	1	–	1	12	–	12	–	–	–
450	2	2	4	9	–	9	–	–	–	6	1	7	–	–	–
500	1	1	2	8	–	8	–	–	–	2	–	2	1	–	1
600	5	1	6	6	1	7	4	–	4	7	–	7	1	–	1
700	1	–	1	5	–	6	1	–	1	6	–	6	1	–	1
800	1	–	1	5	–	5	–	–	–	–	–		1	–	1
900	–	–	–	3	–	3	1	–	1	1	–	1	–	–	–
1,000	1	–	1	–	–	–	–	–	–	1	–	1	–	–	–
1,100	1	–	1	1	–	1	1	–	1	1	–	1	–	–	–
1,200	–	–	–	–	–	1	1	–	1	1	–	1	–	–	–
1,300	–	–	–	1	–	1	–	–	–	2	–	2	–	–	–
1,400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1,500	1	–	1	–	–	–	–	–	–	1	–	1	–	–	–
1,600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1,700	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–
1,800	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–
1,900	1	–	1	1	–	1	–	–	–	1	–	1	–	–	–
2,000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2,100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2,200	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–
Totals	22	5	27	57	1	60	19	–	19	105	3	108	10	–	10

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* The figures for firms of the C type—only 8 in all—can be obtained by subtracting the sum of the figures for P and J from the figures indicating total firms.

† Including Nelson, which was too small to be separately noticed in 1884.

TABLE IX *Contd.—Sizes of firms weaving only.*

Looms.	Number of firms.														
	Colne.			Darwen.			Manchester.			Preston.			Radcliffe.		
	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.
25	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1
50	–	–	–	–	–	–	3	–	3	–	–	–	7	–	7
75	–	–	–	–	–	–	1	–	1	–	–	–	3	–	3
100	1	–	1	–	–	–	3	–	3	–	–	–	5	–	5
150	4	–	4	1	–	1	4	–	4	–	–	–	7	–	7
200	2	–	2	1	–	1	9	–	9	1	–	1	3	–	3
250	–	–	–	6	–	6	6	–	6	3	–	3	4	–	4
300	1	–	1	2	–	2	4	–	4	–	–	–	3	–	3
350	–	–	–	1	–	1	6	–	6	–	–	–	1	–	1
400	1	–	1	–	–	–	4	–	4	1	–	1	1	–	1
450	–	–	–	2	–	2	1	–	1	3	1	4	–	–	–
500	–	–	–	2	–	2	2	–	3	4	1	5	–	–	–
600	–	–	–	4	–	4	4	–	5	5	2	7	–	–	–
700	1	–	1	4	1	5	2	–	2	3	–	3	1	–	1
800	1	–	1	–	1	1	–	–	–	2	–	2	–	–	–
900	–	–	–	2	–	2	–	–	–	–	–	1	–	–	–
1,000	–	–	–	2	–	2	1	–	1	–	–	–	–	–	–
1,100	–	–	–	–	–	–	–	–	–	3	–	3	–	–	–
1,200	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–
1,300	–	–	–	1	–	1	–	–	–	1	–	1	–	–	–
1,400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1,500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1,600	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1,700	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1,800	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1.900	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2,000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2,100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2,200	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
Total	11	–	11	28	2	30	50	–	52	27	4	33	36	–	36

TABLE IX *Contd.—Sizes of firms weaving only.*

Looms.	Number of firms.											
	Rochdale.			Todmorden.			Elsewhere.			All districts.		
	P.	J.	Total.	P.	J.	Total.	P.	J.	Total.	P.	J.	Grand Total.
25	–	–	–	1	–	1	2	–	2	5	–	5
50	3	–	3	1	–	1	5	–	5	24	–	24
75	–	–	–	–	–	–	9	–	9	18	–	18
100	–	–	–	1	–	1	7	–	7	21	–	21
150	8	–	8	1	–	1	11	–	13	52	–	54
200	7	–	7	3	–	3	16	–	16	50	–	50
250	1	–	1	–	–	–	9	–	9	49	–	49
300	2	–	2	1	–	1	8	–	8	42	–	42
350	2	–	2	–	–	–	16	1	17	44	4	48
400	–	–	–	–	–	–	3	–	3	28	–	28
450	2	1	3	1	–	1	7	–	7	33	5	38
500	–	–	–	–	–	–	2	–	2	22	2	25
600	2	–	2	1	–	1	4	6	10	43	10	54
700	–	–	–	–	–	–	3	2	5	28	3	32
800	–	–	–	–	–	–	8	–	8	18	1	19
900	1	–	1	–	–	–	5	1	6	13	1	15
1,000	–	–	–	–	–	–	–	–	–	5	–	5
1,100	–	–	–	–	–	–	–	2	2	7	2	9
1,200	–	–	–	–	–	–	–	1	1	3	1	5
1,300	–	–	–	–	–	–	–	–	1	5	–	6
1,400	–	–	–	–	–	–	–	–	–	–	–	–
1,500	–	–	–	–	–	–	–	–	–	2	–	2
1,600	–	–	–	–	–	–	–	–	–	–	–	–
1,700	–	–	–	–	–	–	–	–	–	1	–	1
1,800	–	–	–	–	–	–	–	–	–	1	–	1
1,900	–	–	–	–	–	–	–	–	–	3	–	3
2,000	–	–	–	–	–	–	1	–	1	1	–	1
2,100	–	–	–	–	–	–	–	–	–	–	–	–
2,200	–	–	–	–	–	–	–	–	–	1	–	2
Total	28	1	29	10	–	10	116	13	132	519	29	557

TABLE X.—*Lancashire Cotton Industry. Geographical distribution of differently organised firms that weave only in* 1911.

	Percentage of total firms.	Number of firms.			Percentages.		
		P.	C.	J.	P.	C.	J.
Accrington	5	15	12	13	37	30	33
Blackburn	10	29	26	26	36	32	32
Bolton	2	4	11	6	18	54	28
Burnley	13	52	40	23	45	35	20
Chorley	2	10	4	5	52	21	27
Colne	9	56	13	6	75	17	8
Darwen	5	21	13	8	50	31	19
Manchester and Salford	5	26	12	8	56	26	18
Nelson	14	62	49	8	52	41	7
Preston	5	20	11	14	44	25	31
Radcliffe	5	26	10	6	62	24	14
Rochdale	3	10	7	6	44	30	26
Todmorden	4	19	10	1	64	33	3
Elsewhere	18	60	43	54	38	27	35
Total	100	410	261	184	48	31	21

TABLE XI.—*Sizes of firms manufacturing cotton (weaving only) in the British Isles outside Lancashire.*

Looms.	Number of firms.						
	Yorkshire.			British Isles exclusive of Lancashire and Yorkshire.			Grand total.
	P.	J.	Total.	P.	J.	Total.	
25	1	—	1	—	—	—	1
50	1	—	1	1	1	2	3
75	2	—	2	2	—	2	4
100	4	2	6	1	1	2	8
150	3	1	4	—	2	2	6
200	7	6	13	1	—	1	14
250	2	4	6	1	—	1	7
300	5	4	9	1	—	1	10
350	1	—	1	2	—	2	3
400	8	2	10	—	—	—	10
450	10	10	20	1	2	3	23
500	—	—	—	3	1	4	4
600	3	2	5	3	—	3	8
700	—	2	2	—	—	—	2
800	—	—	—	1	1	2	2
900	3	2	5	—	1	1	6
1,000	—	—	—	—	—	—	—
1,100	—	1	1	2	—	2	3
Total	50	36	86	19	9	28	114

TABLE XII.—*Cotton Industry. Sizes of firms manufacturing (weaving only) in the United States of America.*

Looms.	Number of firms.																				Grand Total U.S.A.
	Mainly Northern States.														Southern States.						
	Me.	N.H.	Mass.	R.I.	Conn.	N.Y.	Pa.	N.J.	Md.	O.	Wis.	Mich.	Ill.	Total N. States.	Ala.	Ga.	N.C.	S.C.	Tex.	Total S. States.	
25	1	–	16	6	3	7	33	15	1	2	3	1	3	91	–	–	1	1	–	2	93
50	–	2	7	7	–	5	25	1	–	–	–	–	–	47	–	–	2	–	–	2	49
75	–	–	6	2	2	3	13	2	1	–	1	–	–	30	–	–	–	–	–	–	30
100	–	–	6	1	1	–	13	1	–	1	–	–	–	23	–	1	2	–	–	3	26
150	–	–	6	3	2	1	7	1	1	–	–	–	–	21	–	–	1	–	–	1	22
200	–	–	–	2	–	–	8	–	–	–	–	–	–	10	1	–	–	–	–	1	11
250	–	–	–	–	–	2	5	1	–	1	–	–	–	9	–	–	–	–	–	–	9
300	–	–	2	1	–	1	2	–	–	–	–	–	–	6	–	–	–	1	–	1	7
350	–	–	–	–	–	–	2	–	–	–	–	–	–	2	–	–	–	–	–	–	2
400	–	–	1	–	–	–	2	–	1	–	–	–	–	4	1	–	–	–	1	2	6
450	–	–	1	–	–	–	1	–	–	–	–	–	–	2	–	–	–	–	–	–	2
500	–	–	1	1	–	–	1	–	–	–	–	–	–	3	–	–	–	–	–	–	3
600	–	–	–	–	–	–	2	–	–	–	–	–	–	2	–	–	–	–	–	–	2
700	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1
800	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	1
900	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	1
1,000	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1
Over 1,000	–	1	1	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	2
Total	1	3	47	25	8	19	116	21	4	4	4	1	3	256	2	1	6	2	1	12	268

TABLE XIII.—*Cotton Industry. Sizes of firms weaving only in countries of continental Europe.*

Looms.	Number of firms.									
	Austria.	Belgium.	France.	Germany.	Holland.	Portugal.	Spain.	Sweden.	Switzer-land.	Total.
25	—	—	6	21	—	1	11	—	—	39
50	—	—	6	47	—	3	16	—	—	72
75	1	1	4	39	—	1	6	—	1	53
100	4	—	13	67	1	1	12	1	2	101
150	4	1	15	76	3	3	15	—	6	123
200	6	—	9	88	3	—	17	1	7	131
250	4	—	7	60	2	—	3	—	4	80
300	5	1	20	47	5	1	4	—	2	85
350	5	1	9	22	2	—	3	—	4	46
400	3	1	10	18	1	—	5	—	4	42
450	2	2	6	14	2	—	—	—	3	29
500	1	1	9	27	1	—	1	—	3	43
600	1	—	10	22	4	—	—	—	1	38
700	—	1	2	14	1	—	—	—	1	19
800	1	—	4	12	2	—	—	—	1	20
900	—	—	2	7	2	—	—	1	—	12
1,000	—	—	1	4	—	—	—	1	—	6
1,100	1	1	1	3	—	—	—	—	—	6
1,200	—	—	1	4	2	—	—	—	1	8
1,300	—	—	—	1	1	—	—	—	—	2
1,400	—	—	—	3	—	—	—	—	—	3
1,500	—	—	1	—	1	—	—	—	—	2
Over 1,500	1	—	5	7	2	—	—	—	—	15
	39	10	141	603	35	10	93	4	40	975

TABLE XIV.—*Number of firms, spindles and looms in the Lancashire cotton industry in the years* 1884 *and* 1911.

	Type of management.	Firms.		Spindles (in thousands).		Looms (in thousands).	
		1884.	1911.	1884.	1911.	1884.	1911.
Firms spinning only	P.	494	104	16,927	2,789	—	—
	C.	25	145	2,117	8,972	—	—
	J.	120	408	4,997	32,951	—	—
	Total	639	657	24,041	44,712	—	—
Firms doubling only	P.	39	33	461	469	—	—
	C.	—	18	—	324	—	—
	J.	5	5	69	90	—	—
	Total	44	56	530	883	—	—
Firms weaving only	P.	519	410	—	—	204	191
	C.	9	261	—	—	5	166
	J.	29	184	—	—	17	121
	Total	557	855	—	—	226	478
Firms spinning and weaving.	P.	367	71	12,870	2,693	244	57
	C.	37	158	1,925	8,094	38	163
	J.	42	50	1,698	2,503	27	43
	Total	416	279	16,493	13,290	309	263
All firms	P.	1,380	585	29,797	5,482	448	248
	C.	71	564	4,042	17,066	43	329
	J.	191	642	6,695	5,454	44	164
	Total	1,642	1,791	40,534	58,002	535	741

The doubling firms and spindles are included in the totals for firms spinning only.

The totals of spindles and looms are given to the nearest thousand. The figures at the foot of the table coincide with the figures given in the summaries of total spindles and looms in Worrall's Directory; but the number of firms in the table is less than that in Worrall's summary (1,709 in 1884, and 1,966 in 1911). This is largely due to the definition of the term "firm" used in this Paper, but a further reason is that Worrall's summary includes the firms which do not state the number of spindles and looms, whereas such firms have been omitted from our tables.

TABLE XV.—*Sizes of firms spinning only in the woollen and worsted industry of Yorkshire.*

Spindles.	Number of firms.					
	Bradford.	Halifax.	Huddersfield.	Leeds.	Elsewhere.	All districts.
500	—	—	1	—	—	1
1,000	—	—	1	—	2	3
1,500	—	—	7	—	6	13
2,000	4	1	5	—	5	15
2,500	2	—	2	—	5	9
3,000	5	1	5	3	4	18
3,500	4	—	1	1	8	14
4,000	8	1	3	—	7	19
4,500	2	—	—	—	3	5
5,000	3	2	2	1	4	12
5,500	3	1	—	—	—	4
6,000	4	—	—	—	9	13
6,500	4	—	—	1	4	9
7,000	1	2	2	3	1	9
7,500	—	1	—	—	—	1
8,000	2	—	1	—	2	5
8,500	—	—	2	—	1	3
9,000	1	—	1	—	4	6
9,500	—	—	2	—	—	2
10,000	3	2	—	1	6	12
10,500	—	—	1	1	—	2
11,000	1	3	—	1	2	7
11,500	—	1	—	1	—	2
12,000	2	1	1	—	3	7
12,500	—	2	—	—	1	3
13,000	—	—	—	—	—	—
13,500	—	—	—	—	—	—
14,000	2	—	1	—	2	5
14,500	—	—	—	—	1	1
15,000	1	1	3	—	2	7
Over 15,000	13	3	1	4	17	38
Total ...	65	22	42	17	99	245

TABLE XVI.—*Sizes of firms exclusively spinning worsted yarn in the Yorkshire industry.*

Spindles.	Number of firms.			Spindles.	Number of firms.		
	Bradford.	Elsewhere.	All districts.		Bradford.	Elsewhere.	All districts.
500	—	—	—	10,000	3	8	11
1,000	—	1	1	10,500	—	—	—
1,500	—	3	3	11,000	1	4	5
2,000	4	3	7	11,500	—	2	2
2,500	2	1	3	12,000	2	3	5
3,000	5	5	10	12,500	—	1	1
3,500	4	8	12	13,000	—	—	—
4,000	9	5	14	13,500	—	1	1
4,500	4	—	4	14,000	2	—	2
5,000	4	2	6	14,500	1	1	2
5,500	2	1	3	15,000	—	5	5
6,000	6	5	11	15,500	—	—	—
6,500	3	3	6	16,000	2	1	3
7,000	1	2	3	16,500	—	1	1
7,500	—	—	—	17,000	—	1	1
8,000	3	2	5	Over 17,000	10	16	26
8,500	1	1	2				
9,000	1	4	5				
9,500	—	—	—		70	90	160

TABLE XVII.—*Sizes of firms spinning only in the woollen industry of the British Isles, exclusive of Yorkshire.*

Spindles.	Number of firms.			Total British Isles.	Spindles.	Number of firms.			Total British Isles.
	England.	Ireland.	Scotland.			England.	Ireland.	Scotland.	
500	–	1	1	2	7,500	–	–	1	1
1,000	3	1	2	6	8,000	–	–	–	–
1,500	1	–	2	3	8,500	–	–	–	–
2,000	–	–	4	4	9,000	–	–	3	3
2,500	–	–	2	2	9,500	–	–	–	–
3,000	–	–	1	1	10,000	–	–	–	–
3,500	–	–	–	–	10,500	–	–	–	–
4,000	–	–	1	1	11,000	–	–	–	–
4,500	–	–	–	–	11,500	–	–	–	–
5,000	–	–	–	–	12,000	1	–	1	2
5,500	–	–	1	1	Over 12,000	2	–	1	3
6,000	1	–	1	2					
6,500	–	–	–	–					
7,000	–	–	1	1	Total	8	2	22	32

TABLE XVIII.—*Sizes of firms spinning only in the woollen and worsted industry of the United States.*

Spindles.	Number of firms.																	Total U.S.A.
	Conn.	Del.	Ind.	Ky.	Me.	Mass.	Mich.	Minn.	N.H.	N.J.	N.Y.	N.C.	O.	Penn.	R.I.	W.Va.	Wis.	
1,000	—	—	—	—	1	1	1	4	—	—	2	1	—	9	—	—	3	22
2,000	—	1	1	—	—	2	—	—	—	—	1	1	1	12	4	—	2	25
3,000	1	—	—	—	—	3	1	—	—	—	1	—	—	16	3	1	—	26
4,000	—	—	—	—	1	1	—	—	2	2	1	—	1	5	—	—	—	13
5,000	—	—	—	—	2	2	—	—	—	1	—	—	—	9	3	—	—	17
6,000	—	—	—	—	1	5	—	—	—	—	—	—	—	5	1	—	1	13
7,000	—	—	—	—	—	3	—	—	—	—	1	—	—	1	2	—	—	7
8,000	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	4
9,000	—	—	—	—	—	—	—	—	1	—	—	—	—	1	1	—	—	3
10,000	—	—	—	1	—	1	—	—	—	1	—	—	—	2	—	—	—	5
11,000	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	3
12,000	—	—	—	—	—	—	—	—	—	3	—	—	—	—	2	—	—	5
13,000	—	—	—	1	—	—	—	—	—	1	—	—	—	1	1	—	—	4
14,000	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
15,000	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	2
16,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17,000	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	2
18,000	—	—	—	—	—	—	—	—	—	1	1	—	—	1	1	—	—	4
19,000	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	—	—	3
20,000	—	—	—	—	—	1	—	—	—	—	—	—	—	1	1	—	—	3
Above 20,000	—	—	—	—	—	2	—	—	—	—	—	—	—	5	3	—	—	10
	1	1	1	2	5	22	2	4	3	9	7	2	2	78	26	1	6	172

Table XIX.—*Sizes of firms exclusively spinning worsted yarn or worsted and woollen yarn in the United States.*

Spindles.	Number of firms.											
	Del.	Ky.	Me.	Mass.	N.H.	N.J.	N.Y.	O.	Penn.	R.I.	W.Va.	Total U.S.A.
500	–	–	–	–	–	–	–	–	–	–	–	–
1,000	–	–	–	–	–	–	–	–	–	–	–	–
1,500	–	–	–	1	–	–	–	–	1	–	–	2
2,000	1	–	-	–	–	–	2	–	2	1	–	6
2,500	–	–	–	–	–	–	1	–	4	1	1	7
3,000	–	–	–	2	–	–	–	–	4	–	–	6
3,500	–	–	1	–	1	1	–	1	–	–	–	4
4,000	–	–	–	–	1	–	1	–	2	–	–	4
4,500	–	–	1	–	–	–	–	–	3	1	–	5
5,000	–	–	–	1	–	1	–	–	6	2	–	10
5,500	–	–	–	–	–	–	–	–	3	–	–	3
6,000	–	–	1	2	–	–	–	–	1	–	–	4
6,500	–	–	–	–	–	–	1	–	–	1	–	2
7,000	–	–	–	1	–	–	–	–	1	–	–	2
7,500	–	–	–	–	–	–	–	–	–	–	–	–
8,000	–	–	–	–	–	–	–	–	2	–	–	2
8,500	–	–	–	–	1	–	–	–	1	–	–	2
9,000	–	–	–	–	–	–	–	–	–	1	–	1
9,500	–	–	–	–	–	–	–	–	–	–	–	–
10,000	–	–	–	1	–	1	–	–	–	–	–	2
10,500	–	–	–	–	–	–	–	–	–	1	–	1
11,000	–	–	–	–	–	–	–	–	1	–	–	1
11,500	–	–	–	–	–	1	–	–	–	1	–	2
12,000	–	–	–	–	–	2	–	–	–	1	–	3
Over 12,000	–	1	–	4	–	2	1	1	11	9	–	29
Total	1	1	3	12	3	8	6	2	42	19	1	98

TABLE XX.—*Sizes of firms weaving only (distinguished by district) in the woollen and worsted industry of Yorkshire.*

Looms.	Number of firms.					All districts.
	Bradford.	Halifax.	Huddersfield.	Leeds.	Elsewhere.	
25	8	1	13	11	2	35
50	27	6	8	20	12	73
75	21	4	5	10	8	48
100	14	4	3	4	19	44
125	12	1	—	2	10	25
150	6	2	2	1	15	26
175	2	—	1	1	4	8
200	10	1	2	1	8	22
225	2	—	1	—	2	5
250	3	—	—	—	1	4
275	1	—	—	1	—	2
300	4	1	2	—	3	10
325	1	—	—	—	—	1
350	3	—	—	—	2	5
375	1	—	—	—	1	2
400	1	—	1	—	—	2
425	—	—	—	—	—	—
450	1	—	—	—	2	3
475	1	—	—	—	1	2
500	2	—	—	—	2	4
525	1	—	—	—	—	1
550	—	—	—	—	—	—
575	1	—	—	—	—	1
600	—	—	—	—	1	1
625	—	—	—	—	—	—
650	—	—	—	—	—	—
675	—	—	—	—	—	—
700	2	—	—	—	1	3
Over 700	3	—	1	—	1	5
Total	127	20	39	51	95	332

TABLE XXI.—*Sizes of firms exclusively weaving worsted goods in the woollen and worsted industry of Yorkshire.*

Looms.	Number of firms.		
	Bradford.	Elsewhere.	All districts.
25	5	1	6
50	18	14	32
75	12	13	25
100	7	8	15
125	9	4	13
150	4	6	10
175	1	1	2
200	6	4	10
225	1	—	1
250	2	—	2
275	1	—	1
300	4	2	6
325	—	—	—
350	1	—	1
375	1	—	1
400	1	—	1
425	—	—	—
450	1	—	1
475	—	—	—
500	2	1	3
Total	76	54	130

TABLE XXII.—*Sizes of firms weaving only in the woollen and worsted industry of the United States.*

Looms.	Number of firms.													
	Conn.	Ga.	Ill.	Ind.	Ia.	Ky.	Me.	Md.	Mass.	Mich.	Minn.	N.H.	N.J.	N.Y.
25	2	–	1	2	2	2	2	–	9	1	1	1	9	9
50	7	1	–	1	–	–	2	2	12	–	–	3	1	4
75	7	–	1	1	–	–	2	–	5	–	–	1	–	–
100	1	–	–	–	–	1	2	–	8	–	–	2	3	–
125	–	–	–	–	–	–	2	–	5	–	–	–	3	1
150	1	–	–	–	–	–	–	–	2	–	–	1	1	1
175	1	–	–	–	–	–	1	–	1	–	–	1	–	–
200	–	–	–	–	–	–	–	–	3	–	–	1	1	–
225	–	–	–	–	–	–	–	–	2	–	–	–	–	–
250	–	–	–	–	–	–	–	–	1	–	–	–	–	–
275	–	–	–	–	–	–	–	–	–	–	–	–	–	–
300	–	–	–	–	–	–	–	–	1	–	–	–	–	–
325	–	–	–	–	–	–	–	–	1	–	–	–	–	–
350	1	–	–	–	–	–	–	–	–	–	–	–	–	1
375	–	–	–	–	–	–	–	–	–	–	–	–	–	–
400	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Over 400	–	–	–	–	–	–	–	–	2	–	–	–	2	–
	20	1	2	4	2	3	11	2	52	1	1	10	20	16

TABLE XXII *Contd.—Sizes of firms weaving only.*

Looms.	Number of firms.												
	N.C.	O.	Penn.	R.I.	S.C.	Tenn.	Tex.	Vt.	Va.	Wash.	W.Va.	Wis.	Total U.S.A.
25	–	2	62	3	1	1	1	–	2	1	1	2	117
50	1	1	34	3	–	–	–	1	–	–	–	3	76
75	–	–	20	6	–	–	–	–	–	–	–	–	43
100	–	–	12	5	–	1	1	–	–	–	–	–	36
125	–	–	9	2	–	–	–	–	–	–	–	–	22
150	–	–	5	–	–	–	–	–	–	–	–	–	11
175	–	–	3	2	–	–	–	–	–	–	–	–	9
200	–	–	4	2	–	–	–	–	–	–	–	–	11
225	–	–	4	–	–	–	–	–	–	–	–	–	6
250	–	–	–	–	–	–	–	–	–	–	–	–	1
275	–	–	1	–	–	–	–	–	–	–	–	–	1
300	–	–	2	–	–	–	–	–	–	–	–	–	3
325	–	–	–	–	–	–	–	–	–	–	–	–	1
350	–	–	2	–	–	–	–	–	–	–	–	–	4
375	–	–	–	–	–	–	–	–	–	–	–	–	–
400	–	–	1	–	–	–	–	–	–	–	–	–	1
Over 400	–	–	4	–	–	–	–	–	–	–	–	–	8
	1	3	163	23	1	2	2	1	2	1	1	5	350

TABLE XXIII.—*Sizes of firms spinning only in the silk industry of the United States.*

Spindles.	Number of firms.												
	Cal.	Conn.	Ga.	Md.	Mass.	Mich.	N.H.	N.J.	N.Y.	N.C.	Penn.	Va.	Total.
500	–	–	–	–	–	–	–	1	3	–	1	–	5
1,000	–	5	–	–	1	–	–	1	–	–	–	–	7
1,500	–	1	–	–	–	–	–	2	–	–	1	–	4
2,000	–	3	–	–	–	–	–	2	–	–	4	–	9
2,500	–	1	–	–	–	–	–	1	–	–	1	–	3
3,000	–	–	–	–	1	–	–	2	–	–	2	1	6
3,500	–	–	–	–	–	–	–	–	1	–	–	–	1
4,000	–	2	–	1	1	–	1	3	1	–	2	–	11
4,500	–	–	–	–	–	–	–	–	–	–	1	–	1
5,000	–	2	–	–	–	1	–	3	1	–	4	–	11
6,000	1	–	–	–	–	–	–	2	–	–	3	–	6
7,000	–	–	–	–	–	–	–	1	–	–	3	–	4
8,000	–	1	–	–	–	–	–	1	–	–	7	–	9
9,000	–	–	–	–	–	–	–	–	–	–	2	–	2
10,000	–	1	–	–	–	–	–	4	2	1	11	–	19
11,000	–	–	–	–	–	–	–	2	–	–	–	–	2
12,000	–	1	–	–	–	–	–	4	1	–	3	–	9
13,000	–	–	–	–	–	–	–	–	–	–	2	–	2
14,000	–	–	–	–	–	–	–	–	1	–	4	–	5
15,000	–	–	1	–	–	–	–	1	1	–	4	–	7
16,000	–	–	–	–	–	–	–	–	1	–	2	–	3
17,000	–	–	–	–	–	–	–	–	1	–	1	–	2
18,000	–	–	–	–	–	–	–	–	1	–	3	–	4
Over 18,000	–	–	–	1	–	–	–	1	2	1	20	1	26
	1	17	1	2	3	1	1	31	16	2	81	2	158

TABLE XXIV.—*Sizes of firms weaving only in the silk industry of the United States.*

Looms.	Number of firms.												
	Conn.	Del.	Ill.	Md.	Mass.	Mich.	N.H.	N.J.	N.Y.	Penn.	R.I	Va.	Total U.S.A.
25	–	–	1	1	5	–	–	70	29	22	1	–	129
50	–	1	1	–	1	1	–	66	13	21	–	1	105
75	1	–	–	–	1	–	–	27	7	14	1	–	51
100	4	–	–	–	2	–	–	18	5	14	1	–	44
150	–	–	–	1	–	–	–	29	9	15	1	–	55
200	3	–	–	–	1	–	–	11	10	11	1	–	37
250	3	–	–	–	1	–	–	11	2	9	–	–	26
300	2	–	–	–	–	–	–	8	3	7	–	–	20
350	–	–	–	–	1	–	–	4	–	1	1	–	7
400	–	–	–	–	–	–	–	3	1	7	–	1	12
450	–	–	–	–	–	–	–	1	–	5	–	–	6
500	–	–	–	–	–	–	–	5	1	2	1	–	9
600	–	–	–	–	–	–	–	2	–	–	–	–	2
700	–	–	–	–	–	–	–	3	1	1	–	–	5
800	–	–	–	–	–	–	1	1	–	1	–	–	3
900	–	–	–	–	–	–	–	–	–	2	–	–	2
1,000	–	–	–	–	–	–	–	–	–	1	–	–	1
Over 1,000	–	–	–	–	1	–	–	1	–	2	–	–	4
Total	13	1	2	2	13	1	1	260	81	135	7	2	518

TABLE XXV.—*Sizes of firms spinning only in the flax, linen and jute industries of the British Isles.*

Spindles.	Number of firms.			
	England.	Ireland.	Scotland.	British Isles.
2,500	3	1	7	11
5,000	1	—	8	9
7,500	—	3	6	9
10,000	—	3	2	5
15,000	—	8	—	8
20,000	—	6	—	6
25,000	—	1	1	2
30,000	—	3	—	3
35,000	—	1	—	1
40,000	—	—	—	—
45,000	—	—	—	—
50,000	—	—	—	—
60,000	—	1	—	1
70,000	—	1	—	1
Total	4	28	24	56

TABLE XXVI.—*Sizes of firms weaving only in the flax, linen and jute industries of the British Isles.*

Looms.	Number of firms.			
	England.	Ireland.	Scotland.	British Isles.
25	—	—	3	3
50	—	—	3	3
75	—	2	2	4
100	1	3	6	10
150	2	6	7	15
200	1	12	5	18
250	1	5	3	9
300	2	12	5	19
350	—	9	3	12
400	—	9	—	9
450	—	5	2	7
500	—	2	2	4
600	—	3	3	6
700	—	4	4	8
800	—	4	—	4
900	—	—	—	—
1,000	—	1	1	2
Over 1,000	—	2	2	4
Total	7	79	51	137

TABLE XXVII.—*Sizes of colliery businesses in the British Isles.*

Men employed.	Number of firms.				
	England.	Ireland.	Scotland.	Wales.	Total (British Isles).
25	127	5	28	52	212
50	109	2	21	39	171
75	41	—	15	19	75
100	48	1	21	22	92
200	94	1	55	43	193
300	67	1	57	29	154
400	54	—	37	22	113
500	48	—	36	15	99
600	38	—	29	18	85
700	56	—	22	16	94
800	43	—	11	10	64
900	33	—	11	7	51
1,000	31	—	5	7	43
1,100	22	—	5	9	36
1,200	26	—	2	2	30
1,300	31	—	3	3	37
1,400	13	—	2	2	17
1,500	21	—	1	3	25
1,600	29	—	1	2	32
1,700	18	—	3	—	21
1,800	18	—	—	6	24
1,900	11	—	1	3	15
2,000	14	—	—	—	14
2,100	7	—	—	1	8
2,200	8	—	—	4	12
2,300	8	—	—	2	10
2,400	8	—	—	1	9
2,500	8	—	—	2	10
Over 2,500	28	—	—	10	38
Total	1,059	10	366	319	1,784

TABLE XXVIII.—*Sizes of coke-producing firms in the British Isles.*

Coke ovens.	Firms.	Coke ovens.	Firms.	Coke ovens.	Firms.
10	—	90	5	170	1
20	5	100	6	180	3
30	11	110	3	190	1
40	24	120	5	200	3
50	22	130	4	Over 200	15
60	9	140	5		
70	4	150	3	Total	139
80	6	160	4		

TABLE XXIX.—*Sizes of firms producing pig-iron in the British Isles.*

Blast furnaces.	Firms.	Blast furnaces.	Firms.	Blast furnaces.	Firms.
1	5	6	6	11	1
2	26	7	4	12	1
3	20	8	3	Over 12	4
4	19	9	3		
5	14	10	1	Total	107

TABLE XXX.—*Sizes of firms engaged in iron foundry work in the British Isles.*

Number of men employed.	Number of businesses.	Number of men employed.	Number of businesses.
0— 5	259	51— 75	28
6—10	346	76—100	14
11—20	305	Over 100	28
21—30	132		
31—50	93	Total	1,205

The total number of firms in the Directory is 2,065. The change in the unit (first 5, then 10, then 20, then 25 men) is due to the form in which the information is given in the Directory.

DISCUSSION *on* PAPER *by* PROFESSOR CHAPMAN *and* MR. ASHTON.

SIR EDWARD BRABROOK, in proposing the vote of thanks to the readers of the Paper, said he observed that the two periods which were selected for comparison were 1884 and 1911, which was a difference of twenty-seven years. In the summary at the end of the Paper it was referred to as a quarter of a century. He asked if there was any special reason for selecting the year 1884, and whether there were any circumstances in that particular year which might account for the differences. He took it Figure 1 showed that in the early period the number of small firms was very much larger and the number of large firms very much smaller than they were in the second period, 1911; and it would be interesting to know if there was any special reason for that state of things. With regard to the distinction in the form of industry, as between joint-stock companies and private firms, he was rather inclined to think that was a distinction which very much vanished, because a great many bodies which were created as joint-stock companies were in fact one-man companies, and they only adopted that formation for the convenience of obtaining limitation of liability. He observed that the intermediate form marked C was omitted in the graphic tables, and therefore he took it upon that ground there was a difficulty in making a clear distinction between what was a private firm and what was a joint-stock company. He observed also that in the graph relating to these private firms and joint-stock companies there was what one would expect, he thought, that a great number of the smaller firms were private firms and the larger firms were companies, speaking generally, through the table. That seemed natural. He supposed a man who began with small capital began in a small way, and in the ordinary state of things a company, if it were a genuine company, began with large capital and in a large way. With regard, however, to the entertaining general summary which the authors had given at the end, it contained a great deal of interesting and important matter, and he was struck by the observation which gave rise to a kind of comparison between anthropometric statistics and statistics of commerce. That was a remarkable and important observation.

MR. COLLARD, in seconding the vote of thanks, said that as one who was engaged in the woollen industry, though not as a manufacturer, the second section of the Paper was naturally the most interesting to him. He quite endorsed the statement on page 509, that there was a tendency for the worsted, spinning and weaving to be generally carried on by different firms. During the last quarter of a century the complication of designs which had been produced had been so great that, in the better class of worsteds especially, he believed it was now the practice for manufacturers to rely almost exclusively on the spinners for their supplies of yarn, as the varieties of shades and the combinations which were twisted together were so great and so elaborate that it was very unusual for the manufacturers themselves to prepare them. He asked whether the relative value of cotton and wool was in any way responsible for the larger number of spindles and looms possessed by the cotton manufacturers.

Mr. STAMP said that Dr. Marshall had made them familiar with the conception of a representative or typical firm in his expansion of the theory of Value and of Production, and that evening they had rescued it from the region of theoretical abstraction and practically proved it to be a reality which there was no longer any need to be shy about. They could now talk with some assurance about a representative firm in certain of their staple industries. He would like to have seen what the effect on the graph on page 473 would have been if it had been drawn prior to 1907. From his experience of the cotton industry in the neighbourhood of Oldham, Stalybridge, Ashton and Stockport in the 1907 boom, he thought that the one hundred or so mills which were rushed up in that boom year—large mills which in the aggregate were perhaps greater than the whole of the French industry—had a very distinct mode or type, and he considered they must have had a profound influence on the line of this graph. They got that very pronounced type on the line, but he thought it was generally due to the influx of those particular mills in 1907. If that curve had been drawn prior to that the mode would not have been nearly as distinct. From his experience he would say that the distinction drawn between private companies by the method of the title "John Doe and Co." *v.* "Hill Tops Mills Limited" was a pretty accurate one as a whole, and any small error arising from it could be usually neglected. It followed very closely the lines Sir Edward Brabrook had mentioned about the one-man company, which he believed was not as common in the cotton industry as in many others. The disappearance, so to speak, of a large number of smaller private firms since 1884 was very largely due to the combination of two mills together under joint-stock management. Consequently those mills had not disappeared altogether but had come further up the line because of their combination in joint-stock form. He wondered how far one could superimpose that line upon lines for other concerns, and how far they would have their maximum or mode about the same point or cancel each other out. It was impossible to have a common denominator—they could not have spindles, looms, tonnage, or cubic capacity in all the different industries to match, but it would be right to take a proper criterion for each industry and to distribute the number of firms on the measure of that criterion, say, in 10 or 20 magnitudes, and then see whether the type came, as in this case, about the middle magnitude, or, say, the 7th or 12th, or whatever it might be: then, despite the huge differences in the size of the firms, industries and totals, they could, by reducing them to percentages, superimpose the lines and see whether there was any common law for all the firms. He only threw it out as a possible development of that line of thought. Whether it could be done on the census of production idea of net output or on profits he would not like to say, but he had made some study of the question of profits in this relation, and his idea was to draw the line based, not on spindles in thousands, but on profits—the profits for a given year—because they fluctuated so tremendously. One would have to take an average, because in isolated years it might be that big firms were making huge profits and the small ones had not shifted very much. He felt pretty confident that the line would not be distributed like the one before them—it would have some of the same indications but not nearly so pronounced. Theoretically it would appear that, taking, say, the 60 firms at 100,000 spindles, they would have a representative type of profit returned upon their capital. They would all fall very much about the same point, but there would be firms doing better, and firms doing worse, which would run up and down on the other side. If they took any other point the same thing would apply, and they would get compensation for the loss in any one case (that was the smaller firm making a larger profit than its average), so that when they made all those allowances they would still expect to find a line something like this. Yet he did not believe, from actual distribution and plotting some 300 or 400 sets of profits, that that was actually the case. He did not know whether Professor Chapman could throw any light on that question. It was, perhaps, bold of him to pass any criticism upon the admirable tables; but he liked to feel where they had a direct relationship and not an inverse relationship exhibited that the points of minimum magnitude were together. They started at the bottom with nil, and worked up to the maximum that was associated with the minimum of the other scale, and so they got their lines of relationship running up from the bottom left-hand corner to the top at the right, instead of down from the top left corner to the bottom right corner as one was used to seeing in such tables. Instead of the points of minimum relationship being associated together they found they had the maximum of one with the minimum of the other, which was the sort of thing they would expect if they had set out to show an inverse relationship; but seeing that the mind naturally associated that method in direct relationship, that was to say a small number of spindles and a small number of looms, it was more convenient to have those two together. With regard to the table of the last section of the Paper, on coal, it seemed to him the figures were valueless. They could not possibly group themselves about certain figures originally significant and similar to business types, for they were absolutely dominated by the geological conditions. They could not expect to find the same kind of organization at work in the 3-feet seams in Northumberland about 50 fathoms down and those that were 400 fathoms or 600 fathoms in Yorkshire, where the huge capitalist companies were now spending millions of money in sinking their large shafts and establishing their large plants. The things were so totally dissimilar that one was looking for a relationship that must be completely overshadowed by the geological conditions involved. It was like trying to find an average altitude for hotels which depends on the earth where they stand and not upon any inherent business idea about hotel keeping.

Mr. Besso said that the authors, in summing up the causes determining the size of businesses at the end of the Paper, had divided them roughly into objective and subjective causes. One very important consideration was that of the labour available, which, he supposed, might be regarded either as objective or subjective, according as they looked at it from the point of view of the employer or from that of the workpeople. In the cotton industry on the Continent the size of firms was very often limited by the quantity of labour available, and also by the capacity of the labour. In the Lancashire cotton industry it was easy to overlook a very large number of operatives, because the workpeople were all of a very skilled type. On the Continent they required far more overlookers in order to supervise and control a given number of workers; so that a mill of the size that might be most economical on the Continent would not be economical under the conditions prevailing in this country. For example, in a small mill on the Continent it might be possible to employ as many workpeople as could be supervised by, say, one overlooker; but in a mill of the same size in Lancashire half the energy of the overlooker would be wasted, because in Lancashire an overlooker could control a far greater number of operatives; and, therefore, if one only had regard to that item, it would pay to have a larger mill in order to get the best out of the overlooker. On the other hand, it was sometimes the case that in particular neighbourhoods the population was not large enough to enable an employer to build a mill of the size that would be most advantageous if it were possible to staff it adequately. This was only one detail, but it struck him as one of some interest.

The President said that the admirable Paper to which they had listened exemplified particularly well the relation of Statistics to Political Economy—like the relation between observation and deduction in Physics. The conception of a "representative firm" had been made more definite and useful by the concrete illustrations which the authors of the Paper furnished. They had thrown new light on the difficult question how it happens that where the law of "increasing returns" prevails one firm getting a start does not oust all its competitors. The distinction between the "objective" and the "subjective" limit, exemplified by the remarkable case of different firms enclosed within the same building, was an important contribution to Economics. The authors had contributed not only to the application, but to the pure theory of Statistics. The preference of a representative type to an ordinary average which characterised the Paper was a triumph for the "Mode." It had been well remarked by Mr. Yule in the Society's *Journal* that the finding of the mode was connected with the use of an analytical form, a curve defined by an equation. The use of that auxiliary implement, not so much to determine the position of the modes as to ascertain the fact of their plurality, might be suggested as one of the very slight improvements for which the Paper left room. In dealing with plural modes there was often a danger of seeming maximum, a "schein-Gipfel," such as Professor Pearson had exposed in some botanical frequency-groups adduced by Dr. Ludgwig. However, the broad results established by the Paper required no corroboration. There could be no doubt in the case of cotton-spinning about the existence of a double maximum in the number of spindles, established as it was by repeated observation and confirmed by explanation. In conclusion, the President joined with Sir Edward Brabrook in expressing admiration for the delivery of the Paper. A summary such as Professor Chapman had given, presenting the salient features of the Paper *viva voce*, and with his own emphasis, was a distinct addition to the printed matter. A terse restatement of this kind realised the proverb *Bis dat, qui cito dat.*

Professor CHAPMAN, in reply, said many large questions had been raised, but there were very few points one could reply to shortly. Sir Edward Brabrook asked why they had selected 1884. They simply wanted to get as far back as they could. They went to Worralls and found the second issue of their Directory (1884) was the first which they could guarantee as accurate. With reference to the differences between the facts for 1881 and 1911, they (the authors) intended—they were not threatening another long Paper but only a few pages at some future time in the *Journal*—to take certain typical places and find out how the change had come about between 1884 and 1911. Was there continuous movement to a new type, or a leap from type to type Probably the point could be settled by taking three-yearly observations. It was very satisfactory to have Mr. Stamp's confirmation of the general soundness of their method of determining the boundary between companies proper and private businesses of the limited liability form to which Sir Edward had alluded. As regards the greater size of the former, no doubt it was partly due, as Sir Edward suggested, to the fact that a company could easily raise capital. But he imagined there was another explanation also. He thought, when the Paper was read through again, reasons would be found for the view that the company was frequently a special kind of business in reality. In respect of the shades of what was produced and the sort of market catered for, it might be a distinct species of business which from its very nature could be organised on a large scale and managed by a board of directors. Because it was a company it could get plenty of capital, and because its business was what it was it could be a company. As to the point raised with regard to what the graph would have been in 1907, if they carried out their investigation into the stages of growth they would see. He remembered 1907, and he had no doubt a big change did take place about that time. It certainly would be most interesting to compare variations in different industries, as Mr. Stamp suggested. It had occurred to Mr. Ashton and himself that it might be possible to make a comparison between different industries on the basis of capital subscribed to joint-stock companies, but they did not know whether the figures could be obtained. He agreed that the figures for coal were not of much use for the purposes of the Paper. They would insert a sentence to that effect; but the figures reflected, he thought, a little more than geographical facts. The same remarks could be made about the foundry figures. They were only a very indirect index of the magnitude of businesses, because a foundry was only a section of a business in most cases; but, if they found any kind of law operating even in a section of a business, it was a scrap of relevant evidence at any rate. Mr. Besso's remarks were very suggestive, and they would naturally carry weight in view of the investigations connected with the cotton industry made by him abroad. One point brought out in the Paper had some bearing on the remark made by Mr. Besso, namely, that in Russia, a relatively undeveloped country industrially, where one would expect the typical cotton business to be small it happened to be large. When they looked into the matter they found that those in control were usually Englishmen or Germans, which seemed to indicate that the supplies of business capacity were limited. Intensive cultivation, so to speak, of such business capacity as could be got was the natural consequence.

The following Candidates were elected Fellows of the Society:—

T. T. S. De Jastrzebski.
A. W. Domingo.
F. Finch.
F. L. C. Floud.
G. Lightfoot.
A. F. Pease.
H. C. Salmon.
B. Varley.

PRICES OF COMMODITIES IN 1913.

By SIR GEORGE PAISH, *Joint Editor of the "Statist."*

(*In continuation of Mr. A. Sauerbeck's figures.*)

THE following table shows the course of prices of forty-five commodities during the last twenty years as compared with the standard period of eleven years, 1867-77, which in the aggregate is equivalent to the average of the twenty-five years 1853-77 (see the *Journal*, 1886, pp. 592 and 648, and 1893, pp. 220 and 247):—

Summary of Index Numbers. Groups of Articles, 1867-77 = 100.

	Vegetable Food (Corn, &c.).	Animal Food (Meat, &c.).	Sugar, Coffee, and Tea.	Total Food.	Minerals.	Textiles.	Sundry Materials.	Total Materials.	Grand Total.	Silver.*	Wheat Harvest.†	Average Price of Consols.‡ £	Average Bank of England Rate.‡ Per cent.
1894	55	80	65	66	64	53	64	60	**63**	47·6	106	$101\frac{1}{16}$	2·117
'95	54	78	62	64	62	52	65	60	**62**	49·1	91	$106\frac{3}{16}$	2·000
'96	53	73	59	62	63	54	63	60	**61**	50·5	112	$110\frac{3}{4}$	2·483
'97	60	79	52	65	66	51	62	59	**62**	45·3	97	$112\frac{13}{32}$	2·638
'98	67	77	51	68	70	51	63	61	**64**	44·3	116	$110\frac{15}{16}$	3·242
1899	60	79	53	65	92	58	65	70	**68**	45·1	109	$106\frac{7}{8}$	3·754
1900	62	85	54	69	108	66	71	80	**75**	46·4	95	$99\frac{5}{8}$	3·958
'01	62	85	46	67	89	60	71	72	**70**	44·7	103	$94\frac{1}{4}$	3·721
'02	63	87	41	67	82	61	71	71	**69**	39·6	110	$94\frac{3}{8}$	3·329
'03	62	84	44	66	82	66	69	72	**69**	40·7	101	$90\frac{3}{4}$	3·750
1904	63	83	50	68	81	71	67	72	**70**	43·4	90	$88\frac{1}{4}$	3·292
'05	63	87	52	69	87	72	68	75	**72**	45·7	110	$89\frac{13}{16}$	3·008
'06	62	89	46	69	101	80	74	83	**77**	50·7	112	$88\frac{5}{16}$	4·267
'07	69	88	48	72	107	77	78	86	**80**	49·6	113	$84\frac{1}{8}$	4·925
'08	70	89	48	72	89	62	73	74	**73**	40·1	108	$86\frac{1}{16}$	3·013
1909	71	89	50	73	86	64	76	75	**74**	38·9	113	$83\frac{7}{8}$	3·083
'10	65	96	54	74	89	73	81	81	**78**	40·5	102	$81\frac{3}{32}$	3·725
'11	70	90	61	75	93	76	81	83	**80**	40·4	110	$79\frac{5}{16}$	3·467
'12	78	96	62	81	110	76	82	88	**85**	46·1	97	$76\frac{5}{32}$	3·776
'13	69	99	54	77	111	84	83	91	**85**	45·3	105	$72\frac{5}{8}$	4·771
Average 1904-13....	68	91	53	73	95	74	76	81	**77**	44·1	106	$82\frac{25}{32}$	3·733
1890-99....	61	80	63	68	71	56	66	64	**66**	55·8	103	$103\frac{9}{16}$	2·958
'78-87....	79	95	76	84	73	71	81	76	**79**	82·1	97	$99\frac{9}{16}$	3·264

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* Silver 60·84*d*. per oz. = 100.

† Wheat harvest in the United Kingdom to 1895, 29 bushels = 100, from 1896, 30 bushels = 100.

‡ Consols and bank rate actual figures, not index numbers; Consols 3 per cent. to 1888, $2\frac{3}{4}$ per cent. from 1889, $2\frac{1}{2}$ per cent. from April, 1903.

The index number of all commodities was 85 last year, or the same as for 1912. It was again 15 per cent. *below* the standard period 1867-77, but 10 per cent. *above* the average of the last ten years, and 29 per cent. *above* the average of the lowest decade on record, 1890-99 (average index number 66).

The monthly fluctuations were as follows:—

February,	1895....	60·0	December,	1911....	80·9	June,	1913....	84·1
July,	'96....	59·2	,,	'12....	86·4	July,	,, ...	84·2
,,	1900....	76·2	January,	1913....	86·4	August,	,, ...	85·0
December,	'01....	68·4	February,	,, ...	86·1	September,	,, ...	85·7
May,	'07....	82·4	March,	,, ...	86·7	October,	,, ...	84·5
February,	'09....	71·9	April,	,, ...	86·2	November,	,, ...	83·3
December,	'09....	76·3	May,	,, ...	85·7	December,	,, ...	83·8*
,,	'10....	77·9						

The index number showed a tendency to decline almost throughout the year. After again rising to 86·7 in March it fell to 84·1 in June, recovered to 85·7 in September, declined to 83·3 in November, and closed the year at 83·8. That the fall was not greater was due mainly to the further rise in the prices of animal food and to the relatively short crops of textiles, which caused the latter to be maintained at higher figures.

Taking articles of food and materials separately, the index numbers compare thus (1867-77 = 100 in both cases):—

	Average.			Feb., 1895.	July, 1896.	May, 1907.	Feb., 1909.	July, 1912.	Dec., 1912.	Sept., 1913.	Dec., 1913.
	1878-87	1890-99	1904-13								
Food	84	68	73	63·8	60·0	73·5	70·8	84·4	78·4	76·5	75·7
Materials	76	64	81	57·0	58·6	88·9	72·6	88·0	92·2	92·4	89·8

In the aggregate, food was nearly 4 per cent. lower than a year before, and materials fell over 2 per cent. Notwithstanding the fall in the past year materials were still very high. The only groups which were cheaper in December than in the period 1878-87 were vegetable food, and sugar, coffee and tea.

The position of the six separate groups of commodities at the end of the last four years in comparison with whole periods is illustrated by the following index numbers (1867-77 = 100 in each case):—

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* In January, 1914, 83·5, in February 83·8, and in March 82·8, according to the *Statist*.

	Average.			Dec., 1910.	Dec., 1911.	Dec., 1912.	Dec., 1913.	Last Year, per Cent.
	1878-87.	1890-99.	1904-13.					
Vegetable food, corn, &c.	79	61	68	63·9	75·5	72·6	65·6	fall 9·6
Animal food (meat and butter)	95	80	91	91·0	90·0	96·9	100·5	rise 3·7
Sugar, coffee, and tea	76	63	53	51·7	66·2	57·7	52·4	fall 9·2
Minerals	73	71	96	91·1	100·6	117·3	102·5	„ 12·6
Textiles........................	71	56	74	76·1	68·6	82·5	86·3	rise 4·6
Sundry materials........	81	66	76	82·4	80·7	83·2	84·2	„ 1·2

The most pronounced fall during the year was in minerals. The price of pig-iron fell from 73*s.* 6*d.* to 56*s.* per ton, tin from 229*l.* 10*s.* to 171*l.* 10*s.* per ton, and copper from 76⅝*l.* to 65⅛*l.* per ton. Lead was an exception to the fall, and its price was practically unchanged for the year. Coal was also unaltered at 21*s.* 6*d.* per ton, while the average export value of coal for the whole year advanced from 12·70*s.* to 13·94*s.* per ton. Food other than animal declined in price. American wheat was only slightly lower for the year, the price having declined from 36*s.* 6*d.* to 35*s.* 3*d.* a quarter. Flour, however, fell from 32*s.* to 29*s.* 6*d.* per sack. Maize declined from 24*s.* 6*d.* to 23*s.* 6*d.* per quarter. Potatoes showed a heavy decline; at the end of 1912 they were 90*s.* per ton, and at the close of 1913 65*s.* per ton. Rice fell from 9*s.* 3*d.* to 7*s.* 7½*d.* per cwt. Sugar did not move appreciably, but coffee was lower, especially Brazilian, Rio Good falling from 65*s.* 6*d.* to 47*s.* 6*d.* per cwt. Animal food, on the other hand, advanced, particularly beef, mutton and butter. Bacon declined from 73*s.* to 70*s.* per cwt. Textiles remained dear. Cotton (Mid-American) advanced from 7·11*d.* to 7·14*d.* per lb., while jute rose from 23*l.* to 32*l.* per ton. Hemp and flax fell in price, and wool was slightly lower. Hides and leather were steady throughout the year. Oil was cheaper, olive oil having fallen from 54*l.* to 48*l.* per ton. Petroleum was steady, and the price rose from 8¼*d.* to 8½*d.* per gallon. Nitrate fell from 11*s.* 9*d.* to 10*s.* 9*d.* per cwt. Para rubber declined from 4*s.* 7*d.* to 3*s.* 2*d.* per lb.

*Quarterly Movements of Prices.**

Summary of Index Numbers, 1867-77 = 100.

Years.	Quarters.	Vegetable Food (Corn, &c.).	Animal Food (Meat, &c.).	Sugar, Coffee, and Tea.	Total Food.	Minerals.	Textiles.	Sundry Materials.	Total Materials	Grand Total.	Silver.†
1905....	IV	62·9	86·6	46·1	68·1	94·1	75·5	70·8	78·5	74·1	48·8
'06	I	62·1	89·6	45·3	68·7	96·7	76·5	72·1	80·1	75·3	49·7
	II	63·8	89·0	45·1	69·2	99·1	81·3	72·7	82·5	76·8	50·3
	III	61·3	89·3	46·5	68·5	101·4	80·1	73·3	83·0	76·9	50·7
	IV	61·7	87·9	47·0	68·1	110·5	80·4	76·6	86·9	78·9	53·0
'07	I	64·0	88·7	46·7	69·5	112·2	80·0	78·8	88·2	80·2	51·5
	II	69·7	88·7	48·0	72·1	112·6	79·8	80·0	88·7	81·7	50·6
	III	70·1	89·1	49·1	72·7	106·5	76·8	77·5	85·1	79·9	51·9
	IV	73·8	87·0	48·2	73·3	95·9	71·2	76·5	80·1	77·2	43·3
'08	I	71·7	88·9	49·1	73·3	92·0	64·9	73·8	76·0	74·9	42·0
	II	71·1	90·0	50·0	73·7	87·7	62·6	71·7	73·2	73·4	40·3
	III	68·2	90·3	47·2	71·9	88·4	61·7	71·7	73·1	72·6	39·3
	IV	67·8	85·1	47·0	69·8	88·5	61·0	74·3	74·0	72·2	37·7
'09	I	69·3	85·2	48·7	70·8	85·5	60·2	74·4	73·0	72·1	38·5
	II	76·1	91·1	49·6	76·0	84·9	62·8	75·5	74·1	74·9	39·9
	III	70·6	90·6	49·9	73·6	86·5	67·4	75·3	75·9	74·9	39·0
	IV	67·9	88·2	52·8	72·2	88·2	70·3	77·6	78·2	75·7	38·9
'10	I	68·6	95·0	54·6	75·4	90·8	71·4	79·5	80·0	78·1	39·1
	II	64·2	98·8	55·2	75·1	88·1	72·3	80·1	79·9	77·9	40·7
	III	64·6	98·1	53·5	74·6	87·5	72·4	81·7	80·4	78·0	40·5
	IV	63·7	90·6	50·0	70·7	90·1	76·0	82·9	82·7	77·6	41·8
'11	I	65·1	90·1	54·0	72·0	92·2	77·8	82·3	83·6	78·7	39·9
	II	70·1	89·2	55·1	74·0	92·2	82·3	81·3	84·5	80·1	40·3
	III	71·4	88·9	64·7	76·4	92·4	73·9	81·0	81·9	79·6	39·7
	IV	75·7	88·8	69·1	79·2	98·4	69·1	80·7	81·9	80·7	41·5
'12	I	77·8	93·7	67·1	81·4	103·4	72·4	80·7	84·2	83·0	44·1
	II	80·4	98·6	62·6	83·4	107·8	73·9	82·6	86·7	85·3	46·2
	III	77·6	99·2	59·8	81·9	115·0	77·2	82·7	89·7	86·4	47·2
	IV	74·2	93·4	57·8	77·8	116·9	81·0	83·3	91·7	85·8	47·9
'13	I	71·6	101·5	55·7	79·2	113·1	83·0	84·2	91·6	86·4	44·9
	II	71·4	99·1	52·7	77·7	112·3	81·1	83·2	90·9	85·3	45·2
	III	69·3	99·1	52·1	76·6	110·1	85·2	83·2	91·1	85·0	45·6
	IV	65·8	98·7	54·0	75·4	104·8	86·7	83·3	90·1	83·9	44·1

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* The four quarterly figures of each year do not in all cases exactly (in the decimals) agree with the annual averages, as the latter are partly calculated from revised figures. See also the *Journal*, 1893, p. 221; 1895, p. 144; 1901, p. 90; and 1909, p. 70.

† Silver 60·84*d*. per oz. = 100.

The quarterly numbers show the average of the three monthly figures, and by thus eliminating minor fluctuations they give a more trustworthy comparison of the gradual changes in the various groups of commodities.

The following figures show in each case the average index numbers of all the forty-five commodities for ten years (see the dotted line in the diagram of the *Journal*, 1886, and also the *Journal*, 1893, p. 220); they give the best picture of the gradual movement of the *average* prices of *whole periods*, as the ordinary fluctuations are still further obliterated:—

1818-27 = 111
'28-37 = 93
'38-47 = 93
'48-57 = 89
'58-67 = 99
'68-77 = 100
'78-87 = 79
'88-97 = 67

1890-1899 = 66
'92-1901 = 66
'93- '02 = 66
'94- '03 = 66
'95- '04 = 67
'96- '05 = 68
'97- '06 = 70

1898-1907 = 71
'99- '08 = 72
1900- '09 = 73
'01- '10 = 73
'02- '11 = 74
'03- '12 = 76
'04- '13 = 77

The decade 1890-99 was the lowest on record more closely calculated, and since then the average advanced from 66 to 77, or 16$\frac{1}{2}$ per cent.

Silver.—The price of silver declined during the year from 29*d.* to 26$\frac{9}{16}$*d.* per oz., mainly in consequence of the financial stringency and the disclosure of serious financial weakness among a group of Indian native banks and speculators. Towards the end of the year the speculative account in silver, amounting to nearly 3,000,000*l.*, was taken over by a strong syndicate. The fall in the price would probably have been greater but for the marked reduction in the Mexican output, arising from the civil war in that country waged during the greater part of the year. The issue of an international loan of 25,000,000*l.* for China contributed to the strength of the silver market.

The world's production of silver, according to the New York *Commercial and Financial Chronicle*, was as follows:—

	United States.	Mexico.	Australia.	Other countries.	Total.
	oz.	oz.	oz.	oz.	oz.
1881-85........	36,600,000	24,800,000	200,000	25,900,000	87,500,000
'86-90........	46,200,000	30,100,000	6,200,000	29,000,000	111,500,000
'91-95	57,400,090	42,700,000	14,900,000	43,700,000	158,700,000
'96-1900....	55,900,000	53,900,000	12,100,000	45,000,000	166,900,000
1901-05........	55,800,000	62,800,000	11,000,000	37,800,000	167,400,000
'06	56,500,000	55,200,000	14,200,000	39,700,000	165,600,000
'07	56,500,000	61,100,000	19,100,000	48,300,000	185,000,000
'08	52,400,000	73,700,000	17,200,000	59,900,000	203,200,000
'09	54,700,000	73,900,000	16,400,000	66,200,000	211,200,000
'10	57,100,000	71,400,000	21,500,000	72,800,000	222,800,000
'11	60,400,000	79,000,000	16,600,000	69,400,000	225,400,000
'12	63,800,000	74,600,000	14,700,000	71,200,000	227,300,000
'13	67,600,000	60,500,000	14,000,000	70,000,000	212,100,000

The prices and index numbers were as follows (60·84*d.* per oz. being the parity of 1 gold to 15½ silver = 100):—

	Price. *d.*	Index Number.		Price. *d.*	Index Number.
Average 1890-99	34	= 55·8	*Lowest* Nov., 1902	21$\frac{11}{16}$	= 35·6
,, 1903-12	26½	= 43·5	End Dec., 1906 ...	32$\frac{5}{16}$	= 53·1
,, 1893	35⅝	= 58·6	,, Dec. '08 ...	23$\frac{3}{16}$	= 38·1
,, 1909	23$\frac{11}{16}$	= 38·9	,, Dec. '10	25$\frac{1}{16}$	= 41·2
,, '11	24$\frac{19}{32}$	= 40·4	,, Dec. '11	25$\frac{1}{16}$	= 41·2
,, '12	28$\frac{1}{32}$	= 46·1	,, Dec. '12 ...	29	= 47·7
,, '13	27$\frac{9}{16}$	= 45·3	,, Dec. '13	26$\frac{9}{16}$	= 43·7

Gold.—The production was estimated:—

	£
1881-85	21,000,000
'86-90...	23,000,000
'91-95	33,000,000
'96-1900.. . .	53,000,000
1901-05. . .	66,000.000
'06	82.700,000
'07	84,800,000
'08	91,000.000
'09	93.400,000
'10	96,200,000
'11	97,300,000
'12	97,000.000
'13	94.700,000

The *Rate of Discount* in the three principal markets is shown in the following table:—

[Per cent. and two decimals.]

	London.		Paris.		Berlin.		Average of the Three Markets.	
	Bank Rate.	Market Rate.	Bank Rate.	Market Rate.	Bank Rate.	Market Rate.	Bank Rate.	Market Rate.
	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt.
1895	2·00	0·80	2·10	1·59	3·14	2·02	2·41	1·47
1900	3·96	3·70	3·25	3·17	5·33	4·41	4·18	3·76
'07	4·92	4·49	3·47	3·40	6·03	5·12	4·81	4·34
'08	3·01	2·23	3·04	2·25	4·76	3·52	3·60	2·67
'09	3·08	2·26	3·00	1·79	3·93	2·87	3·34	2·31
'10	3·73	3·10	3·00	2·44	4·35	3·54	3·69	3·03
'11	3·47	2·89	3·14	2·67	4·40	3·59	3·67	3·05
'12	3·77	3·60	3·38	3·17	4·95	4·22	4·03	3·66
'13	4·77	4·34	4·00	3·88	5·88	5·03	4·88	4·41

The average rates in 1895 were the lowest on record, those in 1907 and 1913 the highest since 1873.

Review of the year.—Throughout the year rates of discount were high. For the first three months the Bank of England rate was maintained at 5 per cent.; it was then reduced to 4½ per cent. for six months, and restored to 5 per cent. in the last three months. Open market rates were not quite as high as the Bank rate, but everywhere the financial stringency was pronounced and brought about trade reaction in several countries. Stringency in Brazil and Argentina caused the export of considerable amounts of gold from both countries. The situation in Brazil was made worse by a heavy fall in the prices of coffee and rubber. Financial stringency in Canada was in some measure relieved by unprecedented borrowings and by a good wheat crop. On the whole the year was a period of great prosperity; profits were large, wages high, and unemployment at zero. The foreign trade of the United Kingdom exceeded all previous totals. Nevertheless, in some respects the year was disappointing. Peace was not fully restored in the Balkans until the autumn, the war between the allied States and Turkey being followed by the outbreak of hostilities between the Balkan States themselves. Civil war again broke out in Mexico and created a great deal of uncertainty, especially as the United States refused to recognise General Huerta as President. At the close of the year the financial pressure in the great money markets was somewhat relieved, as a good deal of gold had accumulated; but there were signs that trade in many countries had begun to decline. The banks of Germany and of France added largely to their stocks of gold. In the United States, after great activity, trade declined by reason of a bad maize crop, uncertainty as to the effect of a substantial reduction of the tariff and a desire to postpone new commitments pending the introduction of an important new banking measure, creating a number of district reserve banks, and a federal reserve board, and providing almost unlimited powers to issue bank-notes secured by commercial paper backed by a substantial reserve of gold.

The arithmetical mean of the forty-five index numbers, which was 85 in 1913 and 1912, 80 in 1911, 78 in 1910, 74 in 1909, and 80 in 1907, has been subjected to the usual test of using the same index numbers of the separate articles, but calculating each article according to its importance in the United Kingdom on the average of the years 1904-06. In this case the average is 83·3 in 1913 against 83·7 in 1912, 77·7 in 1911 and 1910, 74·9 in 1909, and 77·4 in 1907. It will be seen that on the basis of quantities the ordinary index number, which has to be accepted for general purposes, slightly exaggerates the rise which has taken place, but it is also impossible to give the exact *proportion* of quantities, as they vary from country to country. In the United Kingdom some heavy goods, such as coal, iron and cotton, also corn, meat and wool, have a preponderating weight if quantities are accepted.

The price movements of the external trade of this country—total imports into the United Kingdom and exports of the produce and manufactures of the United Kingdom—were as follows, 1873 called 111 in accordance with my index number (see the *Journal*, 1905, p. 146):—

	Total Imports into United Kingdom and Exports of the Produce and Manufactures of the United Kingdom.			Ratio of Values. 1873 = 111 (1867-77 = 100).	
	Declared Value.	Value at Prices of Preceding Year.*	Values at Prices in 1873.	British Trade.	*Statist's* and Sauerbeck's Index Numbers.
	Mln. £'s	Mln. £'s.	Mln. £'s.		
1873	626·0	—	626	111·0	111
'89	675·3	664·5	1,005	74·6	72
'96	681·7	671·5	1,162	65·1	61
1903	833·8	826·5	1,323	69·9	69
'04	852·2	847·0	1,345	70·3	70
'05	895·3	889·6	1,408	70·6	72
'06 ...	983·7	940·9	1,480	73·8	77
'07	1,072·1	1,023·5	1,540	77·3	80
'08	970·4	1,010·1	1,451	74·2	73
'09	1,003·1	1,010·4	1,511	73·7	74
'10 ...	1,109·0	1,057·7	1,593	77·3	78
'11 ...	1,134·8	1,138·9	1,635	77·0	80
'12	1,232·3	1,209·2	1,743	78·5	85
'13	1,294·5	1,268·6	1,782	80·1	85

* According to the valuable calculations of the *Economist* up to 1912, and of the *Statist* for 1913.

The third column at uniform prices shows the movements of quantities. Last year's total was about 2¼ per cent. larger than in the previous year. Since 1873 there is a total increase in the external trade of 185 per cent. and since 1896, the lowest year of prices, of 53 per cent. The ratio of values (80·1) is considerably lower than the ordinary index number (85) and the weighted number (83·3).

Construction of the Tables.

The Table of *Index Numbers* is based on the average prices of the eleven years 1867-77, and the index numbers have been calculated in the ordinary arithmetical way; for instance, English wheat:—

	s.	*d.*	
Average, 1867-77....	54	6	= 100, average point.
,, '55	74	8	= 137, or 37 per cent. above the average point.
,, 1913	31	9	= 58 ,, 42 ,, below ,,

The index numbers therefore represent simple percentages of the average point.

Certain articles which appear to have something in common have been grouped together, with the following result:—

		1867-77. Total Numbers.	Example for 1913.	
			Total Numbers.	Average.
1. Vegetable food, corn, &c. (wheat, flour, barley, oats, maize, potatoes, and rice)	8 Index Nos.	800	554	69
2. Animal food (beef, mutton, pork, bacon, and butter)	7 ,,	700	695	99
3. Sugar, coffee, and tea	4 ,,	400	214	54
1—3. *Food*	19 ,,	1,900	1,463	77
4. Minerals (iron, copper, tin, lead, and coal)	7 ,,	700	775	111
5. Textiles (cotton, flax, hemp, jute, wool, and silk)	8 ,,	800	670	84
6. Sundry materials (hides, leather, tallow, oils, soda, nitrate, indigo, and timber)	11 ,,	1,100	918	83
4—6. *Materials*	26 ,,	2,600	2,363	91
General average	45 ,,	4,500	3,826	85

The *general average* is drawn from all forty-five descriptions, which are treated as of equal value, and is the simple arithmetical mean as shown above.

*Average Prices of Commodities.**

No. of Article	0	1	2	3	4	5	6	7	8	1—8	9	10
		Wheat.		Flour.	Barley.	Oats.	Maize.	Potatoes.*	Rice.	Vegetable Food.	Beef.‡	
Year.	Silver.†	English Gazette.	American.	Town Made White.	English Gazette.	English Gazette.	American Mixed.	Good English.	Rangoon Cargoes to Arrive.		Prime.	Middling.
	d. per oz.	*s.* and *d.* per qr.	*s.* and *d.* per qr.	*s.* per sack 280 lbs.	*s.* and *d.* per qr.	*s.* and *d.* per qr.	*s.* per qr.	*s.* per ton	*s.* and *d.* per cwt.	Total.	*d.* per 8 lbs.	*d.* per 8 lbs.
1899	$27\frac{7}{16}$	25·8	30	26½	25·7	17	18	70	7·2	—	49	40
1900	28¼	26·11	31·6	27½	24·11	17·7	20¼	78	7·4	—	51	42
'01	$27\frac{3}{16}$	26·9	30	26½	25·2	18·5	22¼	78	6·7	—	49	42
'02	$24\frac{1}{16}$	28·1	30·6	26	25·8	20·2	25	69	6·2	—	54	47
'03	24¾	26·9	31	27	22·8	17·2	22	84	7·3	—	48	42
1904	26⅜	28·4	33·6	28½	22·4	16·4	21½	90	6·7	—	48	42
'05	$27\frac{13}{16}$	29·8	34	28½	24·4	17·4	23	65	6·9	—	47	40
'06	30⅞	28·3	32·6	26½	24·2	18·4	22	67	7·3	—	47	40
'07	$30\frac{3}{16}$	30·7	36	29	25·1	18·10	24½	88	8·3	—	49	42
'08	24⅜	32	37·6	31½	25·10	17·10	26¾	81	7·7	—	52	45
1909	$23\frac{11}{16}$	36·11	41·6	34½	26·10	18·11	27½	66	7·1	—	52	45
'10	24⅝	31·8	36·6	31	23·1	17·4	23¾	72	7·3	—	54	48
'11	$24\frac{9}{16}$	31·8	35	29	27·3	18·10	25¼	87	8·2	—	51	45
'12	$28\frac{1}{32}$	34·9	38	32	30·8	21·6	27½	86	10·1	—	56	49
'13	$27\frac{9}{16}$	31·9	36·5	30½	27·3	19·1	23⅝	78	8·2	—	54	49
Average 1904–13....	26¾	31½	36	30	25½	18½	24½	78	7¾	—	51	44½
1890–99....	34	28½	31½	27½	25½	17½	19½	72	6¾	—	47	37½
'78–87....	50	40	43½	34½	31½	21	25	102	8	—	55½	46
'67–77....	58½	54½	56	46	39	26	32½	117	10	—	59	50

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

1899	45·1	47	54	58	66	65	55	60	72	477	83	80
1900	46·4	49	56	60	64	68	62	67	73	499	86	84
'01	44·7	49	54	58	65	71	68	67	66	498	83	84
'02	39·6	52	54	56	66	78	77	59	62	504	92	94
'03	40·7	49	55	59	59	66	67	72	72	499	81	84
1904	43·4	52	60	62	57	63	66	77	66	503	81	84
'05	45·7	55	61	62	62	67	71	56	67	501	80	80
'06	50·7	52	58	58	62	70	68	57	73	498	80	80
'07	49·6	56	64	63	64	72	75	75	82	551	83	84
'08	40·1	59	67	69	66	69	82	69	76	557	88	90
1909	38·9	68	74	75	69	73	85	56	71	571	88	90
'10	40·5	58	65	67	59	67	73	62	72	523	92	96
'11	40·4	58	63	63	70	72	78	74	82	560	87	90
'12	46·1	64	68	70	79	83	85	74	101	624	95	98
'13	45·3	58	65	66	70	73	73	67	82	554	92	98

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* The annual prices are the averages of twelve monthly or fifty-two weekly quotations; potatoes of eight monthly quotations. January to April and September to December.

† Index numbers of silver as compared with 60·84*d.* per ounce being the parity between gold and silver at 1 : 15½; not included in the general average.

‡ Meat (9—13), by the carcase, in the London meat market.

Average Prices of Commodities—Contd.

No. of Article	11	12	13	14	15	9—15	16A	16B	17	18A*	18B*	18
	Mutton.		Pork.	Bacon.	Butter.		Sugar.			Coffee.		
Year.	Prime.	Mid-dling.	Large and Small, Average.	Water-ford.	Fries-land, Fine to Finest.	Animal Food. Total.	British West Indian Refining	Beet, German, 88 p. c., f.o.b.	Java, Floating Cargoes.	Ceylon Planta-tion, Low Mid-dling.†	Rio, Good.	Mean 18A an 18B.
	d. per 8 lbs.	*d.* per 8 lbs.	*d.* per 8 lbs.	*s.* per cwt.	*s.* per cwt.		*s.* per cwt.	*s.* per cwt.	*s.* per cwt.	*s.* per cwt.	*s.* per cwt.	
1899	54	41	40	51	103	—	10½	10	12¼	90	31	—
1900	59	45	44	60	102	—	11¼	10½	12¾	75	40	—
'01	54	44	49	63	105	—	9¼	8½	10¾	70	35	—
'02	55	44	48	63	102	—	7¼	6¾	8½	70	31	—
'03	58	47	44	60	100	—	8½	8¼	9¾	70	30	—
1904	59	50	39	57	102	—	10¼	10¼	11½	75	37	—
'05	59	51	46	65	107	—	11	11¼	12¾	75	40	—
'06	60	53	49	65	110	—	8½	8⅝	10	75	39	—
'07	60	54	45	63	108	—	9	9½	10⅞	75	31	—
'08	58	52	43	62	114	—	9¼	10½	11½	66†	31	—
1909	52	46	49	71	112	—	10¼	11	12¼	70	35	—
'10	58	52	54	75	114	—	11	12¾	13¼	69	42	—
'11	55	49	46	66	121	—	11½	13	14	83	58	—
'12	59	54	50	69	123	—	11	12¼	13⅜	87	66	—
'13	62	56	55	77	119	—	9½	9½	10⅞	81	53	—
Average												
1904-13 ...	58¼	51¾	47⅝	67	113	—	10⅛	10⅞	12	75½	43¾	—
1890-99....	54½	41½	42½	59	100	—	11½	11½	13¾	98	62	—
'78-87....	64½	53	49	71	116	—	17	18	21½	78	52	—
'67-77....	63	55	52	74	125	—	23	24	28½	87	64	—

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year	11	12	13	14	15	9—15	16A–16B	17	18A*	18B*	18
									*	*	
1899	86	75	77	69	82	552	44	43	103	48	75
1900	94	82	85	81	82	594	46	45	86	63	74
'01	86	80	94	85	84	596	38	38	80	55	67
'02	87	80	92	85	82	612	30	30	80	48	64
'03	92	85	85	81	80	588	36	34	80	47	63
1904	94	91	75	77	82	584	44	40	86	58	72
'05	94	93	88	88	86	609	47	45	86	62	74
'06	95	96	94	88	88	621	36	35	86	61	73
'07	95	98	87	85	86	618	39	38	86	48	67
'08	92	95	83	84	91	623	43	40	76	48	62
1909	83	84	94	96	90	625	45	43	80	55	67
'10	92	95	104	101	91	671	51	47	79	66	72
'11	87	89	88	89	97	627	52	49	95	91	93
'12	94	98	96	93	98	672	49	47	100	103	102
'13	99	102	105	104	95	695	40	38	93	83	88

* Index numbers not included in the general average.

† East India good middling from 1908.

Average Prices of Commodities—Contd.

No. of Article	19A*	19C*	19B*	19	16—19	1—19	20A	20B	21	22	—	23
	Tea.				Sugar, Coffee, and Tea.		Iron.			Copper.		Tin.
Year.	Congou, Common.	Indian Good Medium.	Average Import Price.	Mean of 19A and 19B.		Food. Total.	Scotch Pig.	Cleveland (Middlesbrough) Pig.	Bars, Common.	Chili Bars.	English Tough Cake.	Straits.
	d. per lb.	d. per lb.	d. and dec. per lb.		Total.		s. and d. per ton	s. and d. per ton	£ per ton	£ per ton	£ per ton	£ per ton
1899	5½	7¼	8·82	—	—	—	63·9	60·1	7¼	74	78	123
1900	5¼	6⅜	8·58	—	—	—	69·4	69·3	9	73	77	134
'01	4	5¾	7·67	—	—	—	53·9	45·5	6½	66	71	118
'02	3¾	5¾	7·20	—	—	—	54·6	49·3	6⅛	53	57	121
'03	4¼	6½	7·71	—	—	—	52·3	46·3	6¼	58	62	127
1904	5	6⅜	7·24	—	—	—	51·5	43·3	6⅛	59	63	127
'05	4¼	5¾	7·24	—	—	—	53·6	49·6	6½	70	74	143
'06	4	5¾	7·40	—	—	—	58·9	53·0	7¼	88	92	181
'07	5¼	7	8·13	—	—	—	63·6	55·7	7½	87	92	172
'08	5¼	6⅞	7·96	—	—	—	56·1	50·5	6¾	60	64	133
1909	5	7⅛	8·16	—	—	—	55·1	49·3	6½	59	62	135
'10	4½	7¼	8·23	—	—	—	56·1	50·1	6½	57	61	155
'11	5¼	8½	9·00	—	—	—	53·5	47·3	6⅜	56	60	191
'12	5⅜	8¼	8·78	—	—	—	64·2	58·2	7⅜	73	78	210
'13	5	8¼	9·06	—	—	—	65·6	58·3	7¾	68	73½	201
Average												
1904-13....	4⅞	7⅛	8⅛	—	—	—	57¾	51½	6⅞	67¾	72	164⅘
1890-99 ...	4⅝	7½	9¾	—	—	—	47	41½	5½	50	53	81
'78-87....	6¾	—	12¾	—	—	—	46	38	5½	55	60	89
'67-77....	11¼	—	17¼	—	—	—	69	60	8¼	75	81	105

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year	19A*	19C*	19B*	19	16—19	1—19	20A	20B	21	22	—	23
1899	* 49	—	* 51	50	212	1,241	92	—	88	99	—	117
1900	47	—	50	49	214	1,307	100	—	109	97	—	128
'01	36	—	44	40	183	1.277	78	—	79	88	—	112
'02	33	—	42	38	162	1,278	79	—	74	71	—	115
'03	38	—	44	41	174	1,261	76	—	76	77	—	121
1904	44	—	42	43	199	1,286	74	—	74	79	—	121
'05	38	—	42	40	206	1,316	80	—	79	93	—	136
'06	36	—	43	40	184	1,303	86		88	117	—	172
'07	47	—	47	47	191	1.360	92		91	116	—	164
'08	47	—	46	46	191	1,371	82		82	80	—	127
1909	44	—	47	46	201	1.397	81		79	79	—	129
'10	40	—	48	44	214	1,408	82		79	76	—	148
'11	47	—	52	50	244	1,431	78		77	75	—	182
'12	48	—	51	50	248	1,544	95		89	97	—	200
'13	44	—	52	48	214	1,463	96		94	91	—	191

* Index numbers not included in the general average.

Average Prices of Commodities—Contd.

No. of Article	24	25A	25B	26	20–26	27	28	29A	29B	30A	30B	31
	Lead.	Coal.				Cotton.		Flax.		Hemp.		Jute.
Year.	English Pig.	Wallsend Hetton in London.	New-castle Steam.	Average Export Price.	Minerals. Total.	Middling American.	Fair Dhollerah.	St. Petersburg.	Russian, Average Import.	Manila Fair Roping.	St. Petersburg Clean.	Good Medium
	£ per ton	*s.* per ton	*s.* per ton	*s.* and dec. per ton		*d.* per lb.	*d.* per lb.	£ per ton	£ per ton	£ per ton	£ per ton	£ per to
1899	15⅜	18½	12	10·72	—	3 9/16	2¾	23	24½	41	27	12½
1900	17¼	23½	17½	16·75	—	5 15/32	4 3/16	35	30	39	28	14¼
'01	12¾	20	12½	13·86	—	4¾	3 15/32	38	39½	37	27	12¾
'02	11⅜	18½	11¼	12·29	—	4 27/32	3 11/16	32	37	43	27	12¼
'03	11¾	16½	10½	11·70	—	6·03	4⅛	32	36	36	27	13½
1904	12¼	16¼	9½	11·13	—	6·60	5	36	38½	38	28	14
'05	14¼	15½	9¼	10·56	—	5·09	4 5/32	32	35	39½	29	18½
'06	17½	16½	10½	10·90	—	5·95	4 13/16	33	37	41½	31	23
'07	19½	19¾	14½	12·75	—	6·55	4 7/16	30	34	35	31	21
'08	13⅞	18	12	12·77	—	5·72	4 5/16	23	29½	24½	28	15
1909	13½	17½	11	11·30	—	6·33	4⅞	28	32½	24½	28	13
'10	13¼	17¼	10½	11·72	—	8·00	6	35	37	23	30	14
'11	14⅜	17¾	10⅞	11·43	—	7·04	6	37	43½	20	33	20
'12	18¼	21¾	14¾	12·70	—	6·45	5 5/16	36½	40½	26	37	21
'13	19⅛	21½	15½	13·94	—	7·01	5 11/16	34	41¼	31¾	38	26
Average												
1904-13....	15⅝	18⅛	11⅞	11⅞	—	6½	5	32½	36⅞	30⅜	31⅜	18
1890-99 ..	12	17½	10⅜	10⅜	—	4¼	3	27	27½	26½	25	12
'78-87....	14	16¾	8⅝	9	—	6	4¼	33	34	35½	26½	15
'67-77...	20½	22	12½	12½	—	9	6¾	46	48	43	35	19

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

1899	75	84	—	86	641	40	41	51		87		66
1900	84	107	—	134	759	61	62	69		86		75
'01	62	91	—	111	621	53	51	82		82		67
'02	55	84	—	98	576	54	55	74		90		64
'03	57	75	—	94	576	67	61	72		81		71
1904	60	74	—	89	571	73	74	79		85		74
'05	70	70	—	84	612	57	62	71		88		97
'06	85	75	—	87	710	66	71	74		93		124
'07	95	90	—	102	750	73	66	68		85		111
'08	68	82	—	102	623	64	64	56		67		82
1909	66	80	—	90	604	70	72	64		67		68
'10	65	78	—	94	622	89	89	77		68		78
'11	70	81	—	91	654	78	89	86		68		107
'12	89	99	—	102	771	72	79	82		81		111
'13	93	98	—	112	775	78	84	80		89		140

Average Prices of Commodities—Contd.

No. of Article	32A	32B	33	34	27–34	35A	35B	35	36A	36B	37A	37B
	Wool.			Silk.		Hides.			Leather.		Tallow.	
Year.	Merino, Port Phillip Average Fleece	Merino, Adelaide, Average Grease.	English Lincoln Half Hogs.	Tsatlee.	Index Nos.	River Plate Dry.	River Plate Salted.	Average Import.	Dressing Hides.	Average Import.	St Petersburg. Y.C.	Town.
	*d.** per lb.	*d.* per lb.	*d.* per lb.	*s.* per lb.		*d.* per lb.	*d.* per lb.		*d.* per lb.	*l.* per cwt.	*s.* per cwt.	*s.* per cwt.
1899	17¼	8½	8¼	13		7¾	[illegible]	4·94	13	13½	—	25
1900	15¾	7⅞	7⅞	13	—	8½	6¼	5·31	14	13½	—	27½
'01	13	6¾	6⅞	10½		7½	6	5·34	14	13½	—	28
'02	15	7⅞	6¼	11	—	7¼	6½	5·52	14	14½	—	32½
'03	16	8¼	7¼	13½		8	6½	5·75	14	15½		29½
1904	16	8	10⅛	12⅜		8¼	6¾	5·66	14	15	—	26½
'05	17¼	8¾	12⅜	12¾		9	7¼	5·98	14	15¼	—	26½
'06	18	9¼	13⅜	13¾		10	7½	6·52	16½	16	—	30½
'07	18	9⅞	12¼	15¼		9¼	7¾	6·98	16	17⅞	—	34½
'08	15¾	7⅞	8½	10½	—	8¼	5⅞	6·30	14½	17¼	—	30½
1909	17¾	9¼	9	9¾	—	9¼	7	6·73	15	17¼	—	30½
'10	18¼	9⅞	9⅞	10¼	—	9¼	7½	7·15	16	17½	—	35½
'11	17¼	8¾	10	10⅞	—	9¼	7½	7·17	17	17¼	—	33½
'12	17½	9¼	10½	10⅝	—	10½	8	7·51	17½	17½		33
'13	18	9½	12⅜	11	—	12¼	9½	8·62	19½	19¼	—	34¾
Average 1904–13...	17⅜	9	10⅞	11¾	—	9¼	7½	6⅞	16	17	—	31½
1890–99....	13½	6½	10	11½	—	6¼	5½	5	13¼	13¾	43	25
'78–87 .	18½	8⅝	11¼	15	—	8¼	6¾	6½	15	17	41	35½
'67–77....	21¼	9⅞	19¾	23	—	9	7	6⅞	16	18¾	45	45

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

899	83	42	57	467	85	—	84	—	56
900	76	40	57	526	90	—	87	—	61
'01	62	35	46	478	84	—	87	—	62
'02	72	32	48	489	87	—	87	—	72
'03	78	37	59	526	91	—	87	—	65
904	77	51	54	567	94	—	87	—	59
'05	84	63	55	577	95	—	84	—	59
'06	87	68	60	643	103	—	94	—	68
'07	88	62	66	619	105		97		77
'08	76	43	46	498	90		91		68
909	87	46	42	516	100		93		68
'10	90	51	45	587	106		96		79
'11	83	51	47	609	106		99		74
'12	86	53	46	610	114		101		73
'13	88	63	48	670	133		112		76

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* Port Phillip fleece washed nominal since 1895, exactly in proportion with the value of clean wool.

Average Prices of Commodities—Contd.

No. of Article	38	39	40A	40B	41	42	43	44	45A	45B	35—45	20—45	1—45
	Oil.			Seeds	Petroleum.*	Soda.		Indigo.	Timber.				
Year.	Palm.	Olive.	Linseed.	Linseed.	Refined.	Crystals.	Nitrate of Soda.	Bengal, Good Consuming.	Hewn, Average Import.	Sawn or Split, Average Import.	Sundry Materials. Total.	Materials. Total.	Grand Total.
	£ per ton.	£ per tun.	£ per ton.	*s.* per qr.	*d.* per gall.	*s.* per ton	*s.* per cwt.	*s.* per lb.	*s.* per load.	*s.* per load.			
1899	25	33	20	40	6¼	56	7¾	3½	40	49	—	—	—
1900	27½	36	30½	54	6¾	62	8	3½	41	56	—	—	—
'01	26	38	30	53	6½	65	9	3⅜	39	52	—	—	—
'02	27½	34	28	50	6¼	64	9¾	3¼	39	51	—	—	—
'03	28	33	21	39	6¼	64	9¾	3¼	39	54	—	—	—
1904	27½	32	16	33	6⅛	64	10¼	2⅞	36	51	—	—	—
'05	27	36	18	39	5⅝	64	11	2⅞	38	51	—	—	—
'06	30½	39	20¾	43	6⅛	64	11¼	3	40	55	—	—	—
'07	33	43	23½	44	6¾	64	11¼	3¼	40	57	—	—	—
'08	27½	43	22¼	45	6¾	61	10½	3⅜	36	53	—	—	—
1909	29	50	24¾	49	6⅜	61	10¼	3¼	34	54	—	—	—
'10	35	47	38½	66	6	61	9¾	3⅛	36	57	—	—	—
'11	34½	50	42¼	70	5⅜	57	10	3	38	57	—	—	—
'12	33	48	35¼	60	8¼	53	11¼	2¾	41	60	—	—	—
'13	35¼	49½	24¾	45½	8½	47½	11½	2¾	40	63	—	—	—
Average													
1904-13....	31¼	43¾	26⅝	49½	6⅝	60	10⅝	3	38	56	—	—	—
1890-99...	24½	35	19¼	38	5⅛	53	8¼	4⅜	40	45	—	—	—
'78-87...	32½	40	23	46	6⅞	62	12½	6	47	47	—	—	—
'67-77....	39	50	30	60	12½*	92	14	7¼	60	54	—	—	—

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year.	38	39	40A, 40B	41	42	43	44	45A, 45B	35—45	20—45	1—45
				*							
1899	64	66	67	50	61	55	48	78	714	1,822	3,063
1900	71	72	94	54	67	57	48	85	786	2,071	3,378
'01	67	76	92	52	71	64	47	80	782	1,881	3,158
'02	71	68	87	50	70	70	45	79	786	1,851	3,129
'03	72	66	67	50	70	70	45	82	765	1,867	3,128
1904	71	64	54	49	70	73	40	76	737	1,875	3,161
'05	69	72	63	45	70	79	40	78	754	1,943	3,259
'06	78	78	71	49	70	80	41	83	815	2,168	3,471
'07	85	86	75	54	70	80	45	85	859	2,228	3,588
'08	71	86	75	54	66	75	46	78	800	1,921	3,29
1909	74	100	82	51	66	73	45	77	829	1,949	3,34
'10	90	94	116	48	66	70	43	82	890	2,099	3,50
'11	88	100	125	43	62	71	41	83	892	2,155	3,58
'12	85	96	106	66	58	80	38	89	906	2,287	3,83
'13	90	99	78	68	52	82	38	90	918	2,363	3,82

* Petroleum as compared with the average from 1873-77 only.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*British Budgets*, 1887-88 *to* 1912-13. By Bernard Mallet, C.B. xxiv + 511 pp., 8vo. London: Macmillan and Co., 1913. Price 12*s.* net.

Mr. Mallet begins his review of the budgets of successive Chancellors of the Exchequer with Mr. Goschen's first appearance in that capacity in the year 1887, previous budgets up to 1885-86 having been dealt with in Mr. Sydney Buxton's *Finance and Politics*. The present volume contains the record of twenty-six budgets, and therefore extends a little over a quarter of a century. What an important period that is in the financial history of the country may be inferred from the list of the Chancellors who flourished in it. Mr. Goschen presented six budgets, Sir William Harcourt three, Sir Michael Hicks-Beach seven, Mr. Ritchie one, Mr. Austen Chamberlain two, Mr. Asquith three and Mr. Lloyd George four. The change in public policy is still more apparent from a comparison of the earlier of these budgets with the later ones. As Mr. Mallet points out, the standard of living in all classes of the country has been raised by the expansion of the great industries and of foreign trade, and by the development of London as a centre of finance. The result has been a great increase in the amount of money expended by individuals and by the community. That is not all: if it were, it might, and would probably, in course of time be met by a set back in prosperity and a succession of lean years. It is still more important to note the change that has come over public sentiment as to the principles upon which a large and lavish expenditure should be administered. It appears now to be held that public action and public money may be properly and usefully applied in attempts to solve social problems and to improve the condition of the poor. Mr. Mallet thinks that the reliance upon spontaneous development and individual effort and foresight which was formerly considered to be the only sound way of effecting this great object had been urged in somewhat too dogmatic a manner. The economic consequences of the present policy are not yet fully developed, but they cannot fail to be grave. Allied with this change in public sentiment is the growth of the principles of State socialism, leading to a marked extension of the objects which are sought to be effected by means of taxation. The economic doctrines by which statesmen were formerly enabled to exercise some controlling influence over the ever growing tendency to lavish expenditure have been more and more disregarded and contemned. These domestic changes in the point of view of those who administer the public finances and of the leaders of public opinion have been accompanied by an inevitable increase in the estimates for the Navy and Army consequent upon the measures taken by foreign countries to rival us in naval expansion and commercial enterprise. All these considerations are lucidly set forth by Mr. Mallet: and his analysis of the methods by which the revenue has been so expanded as to cope with them is masterly.

Thus, while Mr. Goschen commenced his career by reducing the income tax from 8*d.* to 7*d.* in his first year of office, and to 6*d.* in his second, and deplored the burden it was on the poorer taxpayers, he left to his successors the differentiation and graduation which have done something to alleviate that burden, but have been accompanied with an increase in the rate of the tax that appears now to be likely to be permanent. Mr. Mallet holds that this graduation, which relieves the poorer at the expense of the richer members of the class of owners of property and income tax payers, and thereby increases the productiveness of the imposts to which it is applied, is now a recognised element in direct taxation. He shows also that the proportion between direct and indirect taxation has been altered during the period under review to the advantage of the poorer sections of the population. It appears to him that the progress which has been made in the endeavour to apportion the burden of taxation according to the ability or capacity of the taxpayer during a period of growing liabilities is probably without a parallel in the fiscal history of great civilised states, and that, judged by the standards which prevail in other countries and which have in the past prevailed among ourselves, the poorer classes are now in a relatively favourable position as regards their obligations to the State.

In Part I of the work Mr. Mallet gives a summary for each year of the statement by the Chancellor of the Exchequer in submitting his budget estimates, and of the principal criticisms offered in the discussion that arose thereon, as well as a clear exposition of the changes that were effected in the taxation of the country. Part II contains a series of tables showing for each year the estimated revenue (1) on the existing basis of taxation, (2) after the proposed changes, and the result in exchequer receipts; also the estimated expenditure (1) as originally presented, (2) as affected by the proposed changes, and the result in exchequer issues. In the case of the estimates for 1909–10, the effect of the revision of the April budget that had to be made in October is also shown in the form of a balance-sheet. Part III contains a series of twenty-four statistical tables showing for each budget year the facts relating to revenue and expenditure generally and also in respect to the various heads under which they are classified; among them, a table showing the proportion between direct and indirect taxation according to Treasury classification, a proportion which has steadily risen from 45 to 55 in the earlier years to 57 to 43 in the later years. The preparation of these tables must have been a matter of considerable difficulty, and workers in statistics will be much indebted to Mr. Mallet for placing in their hands a mass of information so convenient and well arranged. They show a revenue increasing in the quarter century from 90 to 189 millions of pounds sterling, returns of taxable income growing from 507 to 866 millions, and the yield of every penny of tax increasing from 2 millions to 2,830,000. The indebtedness of local authorities is shown to have increased from 227 to 630 millions; the naval expenditure from 13 to 45, and the army expenditure from 17 to 27. The civil service expenditure grew in the same period from 18 to 52 millions. Mr. Mallet's tables give much other detailed information, and prove beyond controversy what a remarkable period in the history of our country the last quarter of a century has been. E.B.

2.—*A Pilgrimage of British Farming*. 1910–12. By A. D. Hall, M.A., F.R.S. xiii + 452 pp., 8vo. London: John Murray, 1913. Price 5*s*. net.

A complete survey of British agriculture, its conditions, its processes and its results, is hardly to be hoped for. The nearest approach to such a work was probably contained in the Reports collected by the old Board of Agriculture a century or more ago, or, in more recent times, by the Royal Commission on Agriculture of 1879. The Royal Commission of 1893 was even more thorough in regard to some districts, but as it only attempted to deal with a few counties in detail its inquiry was necessarily incomplete. To judge the agriculture of these islands by sample districts is quite impossible. The field is too vast and varied for private enterprise to cover, although there have been some noteworthy attempts, as, for instance, by Arthur Young, Cobbett, Caird and, more recently, Sir Rider Haggard.

Mr. Hall has in this volume almost achieved the impossible. He has given in the compass of about 450 pages a vivid account of the farming of these islands—for he goes beyond his title and includes Ireland—which, while crammed full of detail, presents as a whole a broad and comprehensive picture of agriculture at the present day.

An "agricultural tour" in the twentieth century is naturally made by motor, a method which has some obvious advantages over that perforce adopted by Arthur Young and William Cobbett. It enables a comparison of farming under the same seasonal conditions to be made over widely separated districts, and it also enables the most interesting and typical spots to be picked out without losing time in the intervening spaces. Mr. Hall's tour extended over three summers: in 1910 the Southern and Eastern counties as far as the Lothians were visited; in 1911 the West Midlands and the North-Western counties, with a trip to Ireland; and in 1912 detached visits were paid to Wales, the South-Western and Midland counties and to Scotland. The impression given is kaleidoscopic, or, perhaps one should say, cinematographic. The diversity is amazing. Mr. Hall's previous knowledge of British agriculture was probably as extensive as that of any man, and he had two companions—Professor T. B. Wood and Mr. E. S Beaven—whose range of experience is also exceptional. Indeed, if one had to select a jury of three to pass judgment on British farming it would be difficult to find one of equal authority. Mr. Hall remarks that singly or collectively the party possessed a considerable measure of previous acquaintance with most of the districts visited. And yet repeatedly they found instances of conditions and practices which were unknown to them. Mr. Hall observes that they had hardly been prepared for "the great variety presented by British "farming and the diversity of the methods that are practised." "Every few miles of our journey," he continues, "we found our-"selves in a totally different country from a farming point of view. "This indicates that the British farmer has learnt, partly by old "tradition, partly by his personal skill, to adapt his methods very "nicely to his particular environment, whether of soil, or of markets, "or of climate." He adds, very truly, "This diversity of British "farming has been very imperfectly reported; many of the systems "in vogue have not yet reached the textbooks, and are little known "outside their own districts, though they deserve serious economic "study."

There are a hundred points of interest on which one would like to comment in this most attractive book. The descriptions of soils and of crops, of men and of animals, of climate and of landscape, are a series of word-photographs, while the comments are always shrewd and suggestive. One would like to quote the exhortation to landlords to play their rightful part as agricultural leaders, the observations on land legislation in Ireland, the reflections on the economic unit in land holding, the observations on the effect of rents upon tenants and their farming, and so on, but space forbids. One point, more than once insisted on, is useful as a warning against too hastily condemning a farmer for not growing bigger crops. "When one considers," says Mr. Hall, "the possibilities of intensive "farming and the raising of the level of production, it is well to "remember that over a large part of Great Britain the factor "which to-day chiefly limits the yield of grain per acre is the lack "of sufficiently stiff-strawed varieties." At the same time it must be admitted that all farmers are not growing crops up to this limit, and the frequent allusions to farmers who regularly average 5 quarters or more of wheat to the acre over large areas show that there is room for others to improve.

One slip may be noted. The Agricultural Commission of the early eighties was not presided over by Lord Cathcart, who was not, indeed, a member of it. The chairman was the Duke of Richmond.

R.H.R.

3.—*Medico-actuarial mortality investigation.* 3 vols. Compiled and published by the Association of Life Assurance Medical Directors and the Actuarial Society of America. 131, 139, 219 pp., 4to. New York, 1912–13.

This work contains an analysis and tabulation of data respecting the heights and weights of insured persons, the influence of build upon mortality and the rates of mortality experienced among the insured members of certain selected occupations. The data were furnished by several American and Canadian insurance companies, and the analysis was undertaken by a joint committee of the Association of Life Insurance Medical Directors and of the Actuarial Society of America.

In the first volume the height and weight statistics are discussed. The data are based upon 221,819 policies issued on male lives and 136,504 policies issued on the lives of women.

The recorded heights were taken to the nearest inch, in even years of issue half inches were disregarded and in odd years of issue were taken as one inch. Since applicants for insurance are usually in their ordinary street costume when weighed (overcoats, however, and sometimes coats, are removed), there is a difference in weight between summer and winter entries owing to this cause. To obtain fair averages, January and July issues were chosen. This inquiry involved the consideration of three variables—weight, height and age—and the amount of tabulation involved was very considerable. It would, we think, have been of interest to treat the problem by the method of multiple correlation, and the student of that method will find in the volume before us ample data upon which to exercise his ingenuity.

After tabulating the weight and height data, the committee discuss the problem of preparing a standard of expected deaths. The rates ultimately obtained, "M.A. Table," are given in the third volume. In the second volume the influence of height and weight upon mortality are examined. It appears from the study of underweights that, if great care is taken in the selection, underweight, even to a considerable degree, has no detrimental influence on mortality except at the younger ages at entry (males). Overweight to a moderate degree was not found to be a serious impairment at the young ages at entry, but had a material effect at the middle ages. Thus in the age-group 20–24, the mortality among those from 50–80 lbs. overweight was 3 per cent. in excess of the standard, while in the age-group 40–44 it was 75 per cent. in excess. At ages 50–62 it seems that 25–80 lbs. above the average weight is not so serious an impairment as at ages at entry 40–49. In the case of women the statistics were thought to be of less value, but the following conclusions were suggested: (1) The effect of underweight or overweight, particularly at the younger ages, is less than among men, although exhibiting the same general tendencies; (2) at the older ages, underweight to the extent of at least 30 lbs. is an advantage, and overweight a disadvantage increasing with the degree of overweight.

In the concluding volume the mortality, in terms of the standard, experienced in certain selected occupations is described and several interesting results are given. Thus one of the classes dealt with is that of persons employed in hotels where there is a bar. This is subdivided into: (1) Proprietors, superintendents and managers who do not attend the bar; (2) proprietors, superintendents and managers who attend the bar either occasionally or regularly. The ratio of observed to expected deaths is 135 per cent. in the former and 178 per cent. in the latter group. Taking special diseases, it is found that in the second group the mortality from cirrhosis of the liver was six times the standard and from diabetes three times the standard. In the case of breweries, proprietors, managers and superintendents have a mortality ratio of 135 per cent., clerks 130 per cent., and foremen, maltsters, beer-pump repairers and journeymen 152 per cent. The contrast between the incidence of mortality upon the two former subgroups is curious; we have:—

	Ages at entry.	
	15—29.	30—49.
Proprietors, &c.	197 per cent.	133 per cent.
Clerks	90 ,,	176 ,,

It will be seen that the work contains much interesting information, although a good deal of it is more suitable for detailed examination in the columns of a journal devoted to the technicalities of actuarial science than in one taking for its province the whole of statistics. M.G.

4.—*Production: a Study in Economics.* By P. H. Castberg. xvi + 382 pp., 8vo. London: G. Allen and Co., 1914. Price 5*s.* net.

This new edition of a work, first published some seven years ago, is interesting on two accounts at least. The author tells us, on page 164, that "it was quite impossible" for him, "before "beginning to write" the book, "to give time to the study of the "literature of political economy, with which he is thus quite "unacquainted." It may be the case, in consequence, as we can well imagine, that readers possessing such preliminary equipment may have occasion to find some fault with Mr. Castberg's discursiveness; or they may experience at any rate a difficulty in discovering evidence of a satisfying scheme of arrangement of the abundance of his informing valuable material, which has been carefully planned and is consistently pursued. The absence of an index to so considerable a volume might confirm them in this suspicion. But, on the other hand, they will acknowledge the compensating advantage of a refreshing independence of view in the treatment of such familiar topics, for example, as protection. The opinion that a country must be of a certain magnitude to derive from such a fiscal policy national benefits that outweigh the admitted injury to individuals is at least shrewdly conceived and vigorously expounded. Only under such conditions, it is argued, can the improvement, and indeed the cheapening, due to production on an extensive scale be achieved, and even then the action of such monopolistic bodies as Trusts may, it is admitted, rob the dwellers in a country of the lower prices which might be expected to ensue. This example, which we have quoted, is not the only instance of the detachment of belief exhibited by the writer; but we must nevertheless confess that the ideas emphasised by him as the fundamental bases of his exposition do not seem to us to possess great novelty. That producers should hand their goods to traders, and procure back from them those very goods, or their equivalents in foreign or domestic produce, is no doubt true in fact; and the ramifications of the exchange are carefully traced and luminously set forth. But is the whole process thus portrayed other than that implied in the idea, often stated before, that exchange in markets is at once the primary subject, and the necessary precondition, of a science of economics?

Yet in the development of this idea our author is led to devote great, and even perhaps excessive, attention to the mechanism of exchange, and to an account of its convenient instruments consisting of money and its substitutes. There he not only shows the firm grip of essentials which is characteristic of a capacity for lucid cogent reasoning, but he brings into bold relief the other feature of his treatise to which its interest is in our opinion mainly due. He lets English readers know the salient circumstances of Norwegian methods of conducting industry and trade. He affords the means of gaining an adequate and correct acquaintance with the ways and means of Norwegian business, and it is gratifying to be assured by such a volume that economic study is, in effect, being energetically and profitably pursued in this Scandinavian land.

L.L.P.

5.—*Co-Operation and Co-Partnership.* By L. L. Price, M.A. Nation's Library Series. London and Glasgow: Messrs. Collins, 1914. Price 1*s.*

The significant discovery that there is a large market for cheap handbooks presenting the results of modern thought on scientific and literary subjects in a popular guise has imposed a new duty on students and teachers in these domains. For with a section of the public ready and anxious to learn, professors and the technical experts can only refrain from meeting the demand at the risk of seeing the task fall into less trustworthy or competent hands. But in the case of economic or social questions the task is one of peculiar difficulty; for whereas the expositor of some scientific or literary subject has as it were a clean slate on which to write, a book on some question of the day must be written with a continual regard for the opinions and preconceived ideas of its readers. While the purpose of the former is generally to teach some new thing, the function of the latter is to present the reader's own knowledge and experience as part of a wider whole, and success depends on the ability to make the thoughts and observations of the ordinary man fit into their appropriate place in the picture.

Mr. Price's method in the book before us is admirably adapted to this end. Instead of giving detailed descriptions of the various phases of co-operation, he has chosen rather to indicate the part which the movement, on the one hand, was expected to play and, on the other, has in fact played, in relation to the general economic organisation of society. The foundations are broadly laid with a sketch of the features and problems of the industrial system which arose in consequence of the industrial revolution, and thereafter considerable space is given to the place of the Co-operative idea in economic literature and in particular in the work of John Stuart Mill. The idea that "the main road of improvement open to the labouring classes was one which would conduct them across the whole or part of the area intervening between their existing status and that of capitalists"—an idea which was responsible for the emphasis laid by Mill on Co-Partnership in the form of the self-governing workshop—is shown to have had for its backing an erroneous theory of wages and a defective account of the distribution of wealth. Current economic theory has to be reconciled with an improvement in the position of workpeople through other means than were foreshadowed in Mill's forecast; while so far as the Co-operative movement itself is concerned, it is met with the patent fact of the much greater success of Co-operative Associations of Consumers than of Associations of Producers. In Part I, which is entitled "What Co-Operation and Co-Partnership have not done," Mr. Price has given a fresh grouping to the familiar facts of Co-operative history by bringing them into relation with the development of economic theory. The treatment is completely free from technical terminology, but a variety of theories have perforce to be touched upon. In spite, therefore, of the lucid style and method of exposition, it is possible that the full significance of the discussion may be missed by those who are altogether unfamiliar with economic thought. But it is a book which is certain to be fully appreciated by Co-operators and workpeople who have already had their first initiation in these mysteries.

Part II, entitled "What Co-Operation and Co-Partnership have done," is necessarily more familiar in form and presents a résumé of the facts to be found in Co-operative literature, and in official and other reports. This half of the book will be extremely useful to those who have no time to make acquaintance with the fuller sources of information about the recent developments of the Co-operative movement. The best proof of Mr. Price's success in his difficult task is that, by the admission of Co-operators of the writer's acquaintance who are well read in the literature of the movement, he has thrown a new and interesting light on a subject with which they were exceedingly familiar. In the case of a book of this character such testimony is the highest praise. W.T.L.

6.—*Other New Publications.*[*]

Blaiklock (George). The Alcohol Factor in Social Conditions. Some facts for Reformers. The report of an inquiry presented to the National Temperance League. 76 pp., 8vo. London: P. S. King and Son, 1914. Price 1s. net.

[The object of this inquiry has been to trace the relationship of alcoholic drinking to present social and economic evils, and also to ascertain the results of recent social legislation in this connection. The report is divided into three sections: the first dealing with the child at home, at school and in employment; the second with the adolescent, as regards hooliganism, factory morality, and "blind alley" employment, and the third with adults. The latter section is of extensive range, and covers the question of comparative wages, and the standard of living of abstainers and non-abstainers, the relation of intemperance to unemployment, and among other subjects the connection between housing and surroundings and sobriety.]

Brassey (Earl), G.C.B., D.C.L. Seventy years of progress under Free Trade. 72 pp., 8vo. London: The Free Trade Union, 1914.

[The object in publishing a fourth edition has been to keep the statistics up to date and to give extracts from speeches delivered recently by different people bearing on the subjects dealt with in the book.]

Fornasari di Verce (Ettore). Demologia generale. Introduzione allo studio della scienza della popolazione. 96 pp., 8vo. Lucca: Tip. Landi, 1913.

[A study of the problems of population and of the opinions of early and modern writers on this subject.]

Hoare (S. J. G.), M.P. The Schools and Social Reform. The report of the Unionist Social Reform Committee on Education. With introduction by the Rt. Hon. F. E. Smith, K.C., M.P. xiv + 49 pp., 8vo. London: John Murray, 1914. Price 6*d*. net.

[This report does not claim to be more than a general view of the more urgent problems in connection with the present state of public education. An informal committee has not at its disposal the full evidence which an official enquiry can command, and this fact together with the vastness of the subject added greatly to the difficulties in preparing the report. Nevertheless, the committee had the help of several experts, and its recommendations have the weight of expert authority.]

Lefas (Alexandre). L'État et les Fonctionnaires. Études Economiques et Sociales Publiées avec le concours du Collège libre des Sciences sociales. lxix + 396 pp., 8vo. Paris: M. Giard and E. Brière, 1913. Price 10 fr.

[The author's endeavour has been to make a careful and impartial study of the grievances and claims of those employed by the State in France, and also of the events which have led up to these demands. He has examined French legislation past and present for regulating or remedying the conditions of State employment, and he compares them with what has been done in other countries, especially in England and Germany. In the development of his study, the author found that much of the confusion which has occurred in France, in the discussion of this subject, has been due to the absence of a definite understanding of what constituted a State functionary and what was State employment, and in an exhaustive introduction he has endeavoured to supply this want, in the hope that it will facilitate the study of the question as a whole.]

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[*] See also "Additions to the Library," page 592, *sqq*.

Mathieson (F. C. and Sons). Stock Exchanges (London and Provincial). Ten Year Record of prices and dividends . . . . 1904 to 1913. 8th year of issue. 480 pp., la. 8vo. London: Mathieson and Sons, 1914. Price 10*s*.

[The compilers consider that the rise in prices of securities makes these tables of special interest this year, and as they deal with transactions in less-known shares as well as with those officially quoted on the London Stock Exchange, this record forms a necessary supplement to the Stock Exchange official intelligence and other publications of that nature.]

Moses (Robert). The Civil Service of Great Britain. Columbia University Studies. Vol. 57. No. 1. 324 pp., 8vo. New York: Columbia University, 1914. Price 8*s*. net.

[The book does not claim to be an exhaustive history of the Civil Service of England. Its object is to show the stages in the reform of the service, the success of the competitive examinations, and of the plan of attracting the most intelligent and capable young men from the Universities into the Government service. In fact, emphasis has been laid upon examinations, *personnel*, and prospects, rather than on organisation, economy, and conduct of business, the author having constantly in mind the influence of the reformed English civil service upon the civil service of the United States.]

Osborne (Algernon A.). Speculation on the New York Stock Exchange, September, 1904–March, 1907. Columbia University Studies. Vol. 56, No. 1. 171 pp., 8vo. New York: Columbia University, 1913. Price 6*s*. net.

[The author does not claim any originality in his treatment of this subject. It is largely critical of certain commonly accepted opinions in regard to speculation; and certain remedies are suggested, though the author owns that their adoption in the near future is hardly to be expected.]

Seager (Henry Rogers). Principles of Economics. Being a revision of Introduction to Economics. xx + 650 pp., 8vo. London: G. Bell and Sons, Ltd., 1913. Price 10*s*. 6*d*. net.

[This is the fourth edition of Professor Seager's "Introduction to Economics," the third edition of which was noticed in the *Journal* for March, 1907. The title has been changed to avoid confusion with another book by the author published in 1909. Besides bringing the information up to date, several of the chapters have been rewritten and four new chapters have been added dealing with the reform of the system of taxation of the United States, profit-sharing and labour co-partnership, social insurance and socialism.]

Supino (Camillo). Principi di Economia Politica. IV Edizione. ix + 597 pp., 8vo. Napoli: Luigi Pierro, 1914. Price 6 lire.

[The first edition of this book was reviewed at length in the *Journal* for March, 1904. The book was enlarged in later editions, and the present (4th) edition has been further enlarged by the addition of a chapter on assurance, and the book generally has been revised and brought up to date.]

Van Elewyck (Ernest). La Banque Nationale de Belgique. Les Théories et les Faits. Tome 1. vii + 380 pp. Tome 2. 412 pp., 2 vols., 8vo. Brussels: Librairie Falk Fils, 1913. Price 15 fr. the two vols.

[The main object of this book is to refute the claims of certain Belgian socialists for the establishment of a State bank in lieu of the National Bank of Belgium, which they contend is more concerned about private interests than those of the State. It is also an historical description of the National Bank of Belgium, and a treatise of banking generally in Belgium and other countries. The table of contents, which is of the nature of a *précis* of the whole work, adds to the value of the book.]

U.S.A. Annals of the American Academy of Political and Social Science. Vol. 52. March, 1914. No. 141. Reform in Administration of Justice. vi + 278 pp., 8vo. Philadelphia: American Academy of Political and Social Science, 1914.

[This volume consists of a series of Papers by different authors on various phases of the question of reform in the administration of justice. They are grouped under three heads, namely, civil, criminal and foreign practice. As of special interest may be mentioned a Paper by Mr. John Koren, "Crime: from a statistical standpoint." There is an appendix on causes for dissatisfaction with the administration of justice in metropolitan districts, and a supplement of book reviews.]

—— Bulletin of the United States Bureau of Labor Statistics. Whole Number 130. Wheat and flour prices from farmer to consumer. 8vo. Washington: The United States Department of Labor, 1913.

[This report has been prepared for two reasons, the first to ascertain the relation existing between wheat prices and retail prices of flour, and the second, to determine the cost of distribution or the price accretions as the wheat and flour pass through various hands from producer to consumer.]

CURRENT NOTES.

The trade returns for the past month are very satisfactory. Both imports and exports show increased values, though it must be borne in mind that the month had two working days more than March, 1913. In the case of imports the main increase is in raw cotton, and but for the very large fall in the price of rubber the total of the imports would have been further increased by about 967,000*l.* The subjoined figures compare the twelve months ending March, 1914, with the twelve months ending March, 1913:—

[000's omitted.]

Imports.	Twelve months ending March, 1914.	Twelve months ending March, 1913.	Increase (+) or Decrease (−).
Imports, value c.i.f.—	£	£	£
I. Food, drink and tobacco	294,163,	280,486,	+ 13,677,
II. Raw materials and articles mainly unmanufactured	277,571,	280,871,	− 3,300,
III. Articles wholly or mainly manufactured	194.728,	188,757,	+ 5,971,
IV. Miscellaneous and unclassified (including parcel post)	3,287,	2,980,	+ 307,
Total merchandise	769,749,	753,094,	+ 16,655,
Imports of bullion and specie	73,711,	68,674,	+ 5,037,

[000's omitted.]

Exports.	Twelve months ending March, 1914.	Twelve months ending March, 1913.	Increase (+) or Decrease (−).
Exports of produce and manufactures of the United Kingdom, value f.o.b.—	£	£	£
I. Food, drink and tobacco	33,298,	32,034,	+ 1,264,
II. Raw materials and articles wholly unmanufactured	71,083,	63,291,	+ 7,792,
III. Articles wholly or mainly manufactured	415,806,	390,410,	+ 25,396,
IV. Miscellaneous and unclassified (including parcel post)	11,552,	10,175,	+ 1,377,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	16,294,	15.063,	+ 1,231,
II. Raw materials and articles mainly unmanufactured	62,405,	67,322,	− 4,917,
III. Articles wholly or mainly manufactured	29,087,	29,087,	....
IV. Miscellaneous and unclassified (including parcel post)	146,	165,	− 19,
Total, British, foreign and colonial	639,671,	607,547,	+ 32,124,
Exports of bullion and specie	62,294,	63,599,	− 1,305,

[000's omitted.]

Shipping.	Twelve months ending March, 1914.	Twelve months ending March, 1913.	Increase (+).
	Tons.	Tons.	Tons.
Total, British and foreign, *entered* with cargoes	49,097,	46,992,	+ 2,105,
Total, British and foreign, *cleared* with cargoes	68,314,	64,997,	+ 3,317,

Mr. Sauerbeck's index-number of prices for March, as given in the *Statist*, is 82·8, as against 83·8 in February, the average of the eleven years, 1867-77, being taken as 100. That the fall has not been greater arises from the steadiness of certain commodities, more especially animal food and raw and sundry materials. Articles of food were 74·7, as against 76·2 in February, and materials 88·8, as against 89·4. The *Economist* index-number stands at 2,597, as compared with 2,616 in February.

According to the Board of Trade *Labour Gazette* the state of the labour market last February was as follows:—

	Trade Unions making returns. Net membership.	Reported as unemployed.	
		Number.	Percentage.
February, 1914	976,988	22,726	2·3
January, 1914	962,242	24,548	2·6
February, 1913	903,503	17,835	2·0

Employment in February was good on the whole. The coal mining, engineering, and shipbuilding trades continued well employed, and there was a seasonal improvement in the building trades. In most of the other principal industries there was a slight improvement. It was reported by the Labour Exchanges that there was a continuance of the demand for labour in the shipbuilding trades. Some deficiency in the supply of women was reported in the clothing trades and in laundry work. Wages in the iron and steel industries continued to fall, and, in spite of some upward movement in other trades, the net effect was a decline. Compared with the good conditions of February, 1913, employment showed a decline. The engineering trades were not so fully employed, and there was a slight falling off in shipbuilding. The number of pig-iron furnaces in blast was considerably less than in February, 1913, and there was a decline in the textile industries, especially in the woollen and worsted trades. On the other hand, there was an improvement in the building and brickmaking trades.

A report on "Trade and Technical Education in France and "Germany" has been issued by the London County Council [No. 1662. Price 1s.]. The report has been prepared by Mr. J. C. Smail, the Council's Organiser of Trade Schools for Boys. In a covering report Mr. Blair, the Education Officer of the Council, draws attention to a number of important considerations arising out of the investigation, which was conducted by Mr. Smail in Paris, Munich, Leipzig and Berlin. Mr. Blair points out that the Paris professional trade schools are training foremen, leaving these to train the workmen in the shops, whereas the German continuation schools supplement apprenticeship and are aiming at the uplifting of every man in his fourfold aspect of member of his trade, member of his family, member of the community and member of the State. "In Germany the State, the Municipality, the employed and the "employer have all come to believe in education of all types, "including compulsory continuation education. . . . In Berlin, "Munich, Leipzig and other towns the organized efforts of the "State and the Municipality are reaching every boy (and in a few "cases every girl) in a way that would hardly be credited in "England but for the fact that experienced officers have seen it in "operation. . . . The British method makes the best top; it "also produces the worst tail, and it does not do much for the "general raising of the great mass of workers. It must not be "forgotten that the London evening student on the average makes "50 hours' attendance per session, while the German boy makes "240. The German boy must take three or four years' continuation "course; the English boy may take as much as he pleases, and "75 per cent. between 14 and 17 either cannot or do not please "even for one year." A number of important points are emphasized, *e.g.* (i) the cost per student-hour of the same kind of instruction does not differ materially in Paris, Munich, Berlin and London; (ii) Munich and Berlin hold opposite views as to the value of workshop instruction in the continuation schools (Leipzig for fifteen years also opposed the Munich view, but has at length given in); (iii) the syllabuses of instructions call for special study; (iv) Germany is systematically dealing with the problem of training teachers for technical work; (v) the problem of education for unskilled workers (blind alley workers) has been recognized as calling for definite educational treatment.

A Paper on the "Export of Capital and the Cost of Living" recently read by Sir George Paish before the Manchester Statistical Society has been reprinted in pamphlet form. Sir George points out that the cost of living has already begun to decline, and he thinks it will probably fall further in the next year or two in consequence of the strong efforts now being put forth all over the world to produce increased supplies of food and raw material by the aid of the great amounts of capital which the lending countries in general, and Great Britain in particular, have supplied for the purpose. An abnormal depression of credit such as that of the 'nineties is not, in his opinion, likely to recur for many years. He concludes that there are no grounds for apprehending any severe check to credit at the present time, especially having regard to the world's great output of gold, "though there are reasons for expecting "the three countries which have borrowed so lavishly in recent "years" (*i.e.*, Canada, Argentina, and Brazil) "to slow down in "their expenditure of borrowed money for a period, and for "anticipating that a moderate reduction in consumption in proportion to production for a time will bring lower prices of "commodities and a reduced cost of living."

The *Journal of the Farmers' Club* for April contains a Paper by Mr. Theodore G. Chambers on "The Rural Population," which was read at a meeting of the club on March 30. After considering the figures as given in the Census Reports, and dealing with the conclusions to be drawn from them, Mr. Chambers urges that the urbanisation of the country should be encouraged in every possible way, and points out that the spreading of population into the country, carrying the markets for perishable produce into the rural districts, must precede the creation of small holdings. Whether one liked it or not, the country of to-morrow would be urbanised. Petrol was to be to the twentieth century what steam was to the nineteenth, but while steam largely caused aggregation of peoples, petrol would have a centrifugal action, and would tend more and more to spread the population. The benefit to the community would be twofold: first, the dispersal of the population would improve agricultural conditions in that it would extend intensive cultivation, and would enable a large number of people to obtain a living from the cultivation of land; secondly, it would improve the conditions under which the industrial classes work and live. The discussion, in which Mr. G. Udny Yule, Mr. R. H. Rew, Mr. Charles Bathurst, M.P., and others took part, is fully reported.

The first annual report has been issued of the Chief of the Children's Bureau attached to the United States Department of Labour. The bureau was established to investigate and report on all matters pertaining to the welfare of children and child life, especially in regard to infant mortality, the birth-rate, orphanage, juvenile courts, desertion, dangerous occupations, accidents and diseases of children, employment and legislation affecting children in the various states and territories. The first investigation undertaken was of infant mortality. The work of the bureau, however, appears to be hampered by lack of adequate staff and facilities for conducting large inquiries, and a considerable extension is recommended in the report.

A course of five lectures on the Measurement of Social Phenomena will be given at the London School of Economics and Political Science, Clare Market, W.C., by Dr. A. L. Bowley (University Reader in Statistics), at 5 p.m. on Mondays, April 27, May 4, 11, 18 and 25. The purpose of the lectures is to analyze the objects, conditions and nature of measurements relating to societies, with illustrations from current statistics. The treatment will be non-mathematical. The following is a synopsis of the ground to be covered on the various dates:—

April 27.—The ultimate scientific and utilitarian aims of statistical investigation. Definition of nations, classification of areas, density of population.

May 4.—Delimitation of social and industrial classes. Permanence of numerical relations. Position of an individual in a class.

May 11.—Measurements of production and income, consumption and expenditure by nations, classes and individuals.

May 18.—Definitions and measurements of standards of living. Conventional standards.

May 25.—Measurements of economic progress. Population, nominal and real wealth, distribution of wealth among individuals.

The Lectures are addressed to advanced students of the University and to others interested in the subject. Admission will be free, without ticket.

A course of six elementary lectures on "Computing; and some "Mechanical Aids to Calculation" will be given by Mr. H. E. Soper, M.A., Assistant in the Department of Applied Statistics at University College, on Tuesdays, May 5, 12, 19, 26, and June 2 and 9, at 6 p.m. The course is intended to give a brief survey of invention in counting and recording numbers, performing the simple operations of arithmetic, and evaluating numerically statistical functions and formulæ. The fee for the course is 10*s.* 6*d.* Further particulars may be obtained from the Secretary, University College, Gower Street, W.C.

Mr. G. Findlay Shirras has been appointed Director of the Department of Statistics of the Government of India which has been created recently. Since 1905 the work has been under the Director-General of Commercial Intelligence, who will now confine himself purely to commercial intelligence.

The third instalment of Professor Edgeworth's article on "The "use of analytical geometry to represent certain kinds of statistics" will appear in the May number of the JOURNAL.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Bankers' Magazine. April, 1914—Banking reform in the United States. Progress of banking in Great Britain and Ireland during 1913. No. 3—balance sheets of banks in the United Kingdom. Credit and trade in the United States and Canada.

Financial Review of Reviews. April, 1914—The Mexican crisis: *Enriquez* (*Dr. R. de Zayas*). The fight for London traffic: *Wright* (*Arnold*). The railway labour problem: *Good* (*T.*). The Panama Canal as a commercial proposition: *Watt* (*Henry A.*) and *Hynes* (*T.*).

Journal of the Statistical and Social Inquiry Society of Ireland. December, 1913—Land purchase in Ireland—a retrospect and a forecast: *Lynch* (*Mr. Commissioner*). President's address.—The significance of some recent Irish statistics: *Finlay* (*Rev. T. A.*). International time: *Stannell* (*Charles A.*). The Irish meat industry: *Anderson* (*R. A.*). The Census of Ireland, 1911: *Thompson* (*Sir William J.*, M.D.). Some considerations in reference to the establishment of the office of a Public Trustee in Ireland: *O'Connell* (*J. R.*). The Dublin housing question.—Sanitary and insanitary: *Dawson* (*Charles*).

Proceedings of the Royal Philosophical Society of Glasgow. Vol. 44, 1912-13—Second thoughts of an economist: *Smart* (*Prof. William*). Co-operation in relation to the industrial system: *Barnes* (*G. N.*, M.P.). The future of the coloured races in our African Colonies: *Falconer* (*J. D.*) The house as a contributory factor in the death-rate: *Chalmers* (*A. K.*). Labour unrest in the shipping industry: *Raeburn* (*William H.*). Discussion on housing in Scotland.

UNITED STATES—

American Economic Review. March, 1914—The new income tax: *Blakey* (*Roy G.*). Farm credit conditions in a cotton state: *Haney* (*Lewis H.*). Interest theories, old and new: *Fetter* (*Frank A.*). Some aspects of the immigration problem: *Kohler* (*Max A.*).

Journal of Political Economy. March, 1914—Trade unionism in the United States. General character and types: *Hoxie* (*Robert F.*). The tariff of 1913: *Willis* (*H. Parker*). Some aspects of the waterways question: *Moulton* (*H. G.*). Shall we have an introductory course in social science? *Wolfe* (*A. B.*).

Political Science Quarterly. March, 1914—The federal income tax: *Seligman* (*E. R. A.*). The theory of public employment offices and the principles of their practical administration: *Leiserson* (*W. M.*). Commerce and war: *Johnson* (*Alvin S.*). The Minnesota rate cases; the problem of federal *versus* state railway-rate control: *Bauer* (*John*). Recent developments of proportional representation: *Williams* (*J. Fischer*).

AUSTRIA—

Statistische Monatschrift. January, 1914—Die Jubiläumsfeier der k.k. Statistischen Zentralkommission. Zum 20jährigen Bestande des Statistischen Landesamtes für Steiermark: *Wittschieben (Dr. Otto)*. Individualistische und kollektivistische Statistik: *Žižek (Dr. Franz)*. Das Frauenstudium in Österreich: *Lorenz (Dr.)*.

FRANCE—

Bulletin de Statistique, Ministère des Finances. February, 1914—Dépenses occasionnées par l'occupation du Maroc depuis le 5 août 1907, jusqu'au 31 décembre 1912. La nouvelle évaluation des propriétés non bâties. Les opérations de la Banque de France pendant l'année 1913.

Journal des Économistes. March, 1914—Les causes du déficit: *Guyot (Yves)*. L'hypocrisie d'une comptabilité publique: *Garcin (F.)*. La suppression du régime des délimitations administratives: *Fernand-Jacq.* Rapport du taux de la Banque d'Angleterre et de la réserve (avec graphiques): *Mondet (N.)*. La législation sur les accidents du travail et l'agriculture: *Zolla (Daniel)*.

Journal de la Société de Statistique de Paris. March, 1914—Les beaux temps de la Bourse: *Neymarck (Alfred)*.

La Réforme Sociale—

March 16, 1914—L'enfance malheureuse en France (*continued in next issue, April* 1, 1914): *Charpin (Frédéric)*. La question champenoise, commerce et viticulture: *Lemaire (René)* and *Bohem (M. de)*. Deux expériences sociales à Saint-Etienne: *Fournier-Lefort (M. J.)*. La profession représentée dans la région organisée: *Choleau (M. Jean)*.

April 1, 1914—L'extension du village. Sa transformation en agglomération industrielle: *Hottenger (M. G.)*. La crise de la main d'oeuvre agricole: *Dufourmantelle (M. Maurice)*.

Revue d'Économie Politique. March–April, 1914—Théorie pono-physiocratique de la population avec quelques réflexions sur la dépopulation française: *Effertz (O.)*. Etude critique du monisme économique de M. Achille Loria: *Turgeon (Charles)*. Les changes étrangers: *François (G.)*. Chronique des questions ouvrières: *Lescure (J.)*.

GERMANY—

Archiv für Rassen- und Gesellschaft-Biologie. Heft 5, 1913—Auslesewirkungen bei biologisch-statistischen Problemen: *Weinberg (Dr. W.)*. Rekrutierungsstatistik des Deutschen Reiches 1902-1913 und Friedenspräsenzstärke: *Claussen (Dr. Walter)*. Religion u. Geburtenrückgang: *Wolf (Dr. Julius)*. Der Erfolg alter und neuer ehelicher Geschlechtssitten in Bayern: *Grassl (Dr. J.)*. Rassewertung in der hellenischen Philosophie: *Lenz (Dr Fritz)*.

GERMANY—*Contd.*

Deutsches Statistisches Zentralblatt—

February, 1914—Die Methode der Sterblichkeitstafel und ihre Anwendung auf andere statistische Probleme: *Landsberg* (*Prof. Dr. O.*). Statistik oder Sterblichkeitsmessungen? *Kaufmann* (*Prof. Dr. Al.*).

March, 1914—Erkenntnistheorie und Statistik: *Günther* (*Dr.*).

Jahrbücher für Nationalökonomie und Statistik (*Conrad's*). *March*, 1914—Bemerkungen zu dem Problem Lorenz Stein—Karl Marx: *Földes* (*Béla*). Die Struktur des Ausgabenbudgets verschiedener Bevölkerungsschichten auf Grund neuerer haushaltungsstatistischer Erhebungen: *Albrecht* (*Gerhard*). Berufliche Einflüsse auf die Fruchtbarkeit der fortpflanzungsfähigen Bevölkerung: *Gottberg* (*M.*). Wohlfahrtseinrichtungen in Industriebetrieben Englands: *Winkelmann* (*Kaete*). Der Ehebruch als Scheidungsgrund in der neueren Eheschiedungsstatistik: *Jaeckel* (*Reinhold*). Die Brotpreise in Berlin 1913: *Guradze* (*Hans*).

Zeitschrift für Socialwissenschaft—

Heft 3, 1914—Das Wirtschaftsjahr 1913 und die gegenwärtige Wirtschaftslage: *Pohle* (*L.*). Nutzen und Kosten als Ausgangspunkte des menschlichen Wirtschaftens (*continued in next issue*, *Heft* 4, 1914: *Heyn* (*O.*). Die Tragweite und der öffentlich-rechtliche Begriff des Grundeigentums: *Bredt* (*J. V.*).

Heft 4, 1914—Zur Dogmatik und Reform des Koalitionsrechtes: *Oertmann* (*P.*). Kapitalistischer Geist und Klassenbewusstsein: *Pringsheim* (*O.*). Volksvermehrung in Indien: *Fehlinger* (*H.*).

ITALY—

Giornale degli Economisti e Rivista di Statistica. *March*, 1914—Il salario ed il tenore di vita degli operai giapponesi: *Mortara* (*Giorgio*). Le condizioni naturali ed economiche della Siberia: *Griziotti-Kretschmann* (*J.*). Le condizioni economiche della provincia di Palermo: *Mercadante* (*Tommaso*). Le societa economiche meridionali: *Vita* (*Enrico*). Luigi Rameri: economista e statistico: *Bertolini* (*Angelo*). La statistica delle elezioni generali politiche per la XXIV legislatura: *Silvestri* (*Mario*). La Tripolitania settentrionale.

La Riforma Sociale. *March*, 1914—Prime linee per una teoria del "Dumping." (A proposito dell' accordo siderurgico italo-tedesco): *Cabiati* (*Attilio*). Sul deprezzamento delle esportazioni: *Loria* (*Achille*). Il "Dumping" e la discriminazione dei prezzi: *Jannaccone* (*Pasquale*). Il "Dumping" considerato dal lato practico, oppure: un caso tipico di "Dumping": *Ridolfi* (*R.*). Discutendo sul "Dumping": *Cabiati* (*Attilio*). Note in margine alla replica del Prof. Attilio Cabiati: *Loria* (*Achille*), *Jannaccone* (*Pasquale*) and *Ridolfi* (*R.*).

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MONTHLY LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since March 8, 1914, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

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—— Rapport sur les résultats donnés jusqu'à ce jour par la loi du 12 Juillet 1909 sur la constitution d'un bien de famille insaisissable. 2 pp., fol. 1913. (*Id.*)

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Vol. LXXVII.] [Part VI.

JOURNAL

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MAY, 1914.

Rural Population *in* England *and* Wales: *a* Study *of the* Changes *of* Density, Occupations, *and* Ages.

By A. L. Bowley, Sc.D.

[Read before the Royal Statistical Society, April 21, 1914,
Mr. G. Udny Yule, M.A., Honorary Secretary, in the Chair.]

I.—*The separation of Rural from Urban Areas, and the changes in their population.*

In this paper I propose to give the results of an analytical study of the nature and changes of rural population in England and Wales. Rural population might be defined either from consideration of its density, or of its occupations, or from its position in the scheme of local administration; or it might be taken as the residual of the population of the Kingdom after that of a scheduled list of boroughs and towns had been abstracted. Of these definitions I regard that which depends mainly on density as most satisfactory, while that depending on the administrative distinction between Urban and Rural Districts is not only misleading but also inapplicable to the Census statistics prior to 1891. Actually the great majority of Urban Districts and County Boroughs have a density of over 1 person per acre, and the great majority of areas whose density is less than this are in Rural Districts, so that a simple density line does in fact correspond nearly with the administrative distinction; but about 80 (out of the 657) Rural Districts have a density between 0·5 and 1 per acre, and in these the majority of the population is connected with industry or mining or with neighbouring towns. Rural Districts which contain no industrial or urban constituents have rarely a density of more than 0·3. For the purposes of this paper I might have defined briefly rural areas as those administrative Rural Districts whose density in the Census of 1911 was 30 per 100 acres or less, and the rural population as the population enumerated on these areas; but I have modified this definition in practice on the one hand by including a small number of districts where the density was between 30 and 50 per 100 acres, and on the other hand by taking the civil parish as the unit and excluding a number of dense parishes in sparse districts. The inclusion or exclusion of a particular parish was a matter of judgment; and more local knowledge than I possess of those regions which, though mainly rural, have some urban disturbance, would be necessary if a hard and fast line were to be drawn. My method was to challenge the districts with density over 30 and the parishes with density over 40, and to find by any means I could whether this density was due to the presence of mines, or of factories, or to scattered industry on a large scale, or to its use as a place of residence for people whose work was in neighbouring towns, or to military disturbance, or to the scattered homes of the leisured, or to provision for summer visitors. If I could find no such reason, I left the parish as rural and assumed special agricultural development.[1] The list of districts and parishes actually subtracted for the construction of Table I is given in Appendix I, pp. 629 *seq.* For the same table, use was made of the Census accounts of disturbing influences, and the inhabitants of schools, of urban hospitals and poor law institutions situated in country districts,[2] and soldiers and sailors and others, were subtracted; and further, when the parish contained temporary occupants, owing to the construction of railways, waterworks, &c., or to any other reason, whose number could not be distinguished, the whole parish was omitted so as not to vitiate comparison.

The rural population thus defined must be distinguished from the agricultural population; for as will presently be seen the latter is to be found in large numbers in Urban Districts as well as in dense Rural Districts, while in the Rural Districts as a whole the majority of the population is not directly agricultural. One importance of this particular analysis lies in showing that the growth of the population of rural areas, taken crudely, is dominated by urban influences.

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[1] In a few cases a parish of small area is dense from the presence of a large village, whose inhabitants work on the land in neighbouring parishes.

[2] County asylums were subtracted from the rural districts in which they were situated, and are not replaced in Table I; but in Table III they were included in the registration counties.

Some difficulties due to change of boundaries arose in Table I in comparing the 1911 population with that of 1891, but none of them were serious, and they were met by reasonable hypotheses as to the proportion of population affected. When, however, the work of carrying back the comparison to 1861 was undertaken, the difficulties were great and the complexity almost overwhelming. This part of the analysis was carried out entirely by Mr. A. R. Burnett-Hurst at the School of Economics, who also prepared much of the other material and helped in most parts of the statistics; without his co-operation the work would have been prohibitive. We followed the usual Census plan, by defining the areas as in 1911 and estimating the population at former dates on these areas. The unit taken was the civil parish and the whole calculation made from the reports on populations in Registration Districts. As nearly as possible the same areas were taken as for Table I, and the same adjustments made for occasional population. Between each pair of consecutive censuses a vast number of changes has been made, many of them affecting the boundaries of civil parishes. Where these took place in districts to be treated as rural, their nature had to be traced, and approximations made (in the light of density of proportion, and of the movement in neighbouring parishes) as to the populations at earlier dates of the areas affected. In a few cases the data were so insufficient that the error might have vitiated the totals, and then the whole registration district or sub-district had to be excluded; such exclusions account for the difference (550,000) between the figures for the rural population in 1911 in Tables I and III. Since adjustment of boundaries generally takes place where industrial or suburban growth is marked, the districts excluded for this reason were principally in the neighbourhood of towns or industries. The population included in each Registration District of which the whole or part was treated as rural is given for the years 1861, 1901, 1911, together with its density in 1911, in Appendix II, pp. 634 *seq.* In a few cases it was necessary to throw two districts together. Where the approximation was specially uncertain the doubtful number is asterisked in the list. It is believed that none of the errors could sensibly affect Table III, where the numbers are estimated to the nearest 1,000. The detailed work was carried out to the nearest 100.

We may now turn to the tables.

TABLE I.—*The population* (1891-1911) *of the administrative Rural Districts in each county, and of those areas of England and Wales which were practically uninfluenced by urban, industrial or mining conditions in* 1911.

Population in 000's. *Density: persons per 100 acres.*

Administrative Counties.	Population in aggregate of Rural Districts.			Density in 1911.	Population, after subtraction of mining, industrial and suburban areas.			Density in 1911.	Percentage growth 1901-11.
	1891.	1901.	1911.		1891.	1901.	1911.		
Cornwall	190	186	184	**23**	154	149	145	**19**	—
Devon	236	224	227	**15**	233	219	220	**14**	—
Somerset	247	242	250	**25**	203	192	194	**21**	—
Dorset	109	101	105	**17**	106	97	98	**16**	—
Wilts	162	154	161	**19**	146	134	136	**17**	—
South-Western*	754	721	743	**19**	688	642	648	**17**	*1*
Hants and Isle of Wight	211	223	260	**27**	155	159	176	**21**	*11*
Surrey	130	162	223	**64**	53	59	67	**32**	
Kent	287	294	312	**36**	194	190	197	**27**	—
Sussex	194	198	219	**26**	181	181	195	**23**	—
Berks	127	127	139	**31**	95	90	94	**24**	—
Bucks	126	128	140	**31**	90	87	89	**23**	—
Herts	94	97	117	**33**	63	61	64	**23**	—
Home Counties†	828	844	927	**31**	623	609	639	**24**	*6*
Essex	230	237	265	**31**	170	165	175	**24**	—
Suffolk	201	191	195	**22**	195	185	187	**21**	—
Norfolk	263	253	261	**21**	261	250	256	**20**	—
Camb and Ely ...	107	103	110	**22**	103	98	102	**21**	—
Hunts	30	30	30	**15**	30	30	30	**15**	—
Lincs	250	239	255	**16**	243	231	238	**15**	—
Eastern	1,081	1,053	1,116	**21**	1,002	959	988	**19**	*3*
Bedford	80	75	78	**27**	71	66	67	**24**	—
Leicester	128	137	151	**31**	74	74	76	**18**	—
Rutland	17	16	17	**18**	17	16	17	**18**	—
Northants and Peterboro'	133	129	131	**22**	120	113	113	**20**	—
Oxford	104	96	100	**22**	95	87	89	**20**	—
Gloucester	223	223	231	**31**	145	136	141	**22**	—
S. Midland	685	676	708	**27**	522	492	503	**21**	*2*
Monmouth . ..	43	43	47	**13**	37	36	39	**11**	—
Hereford	78	75	74	**14**	77	75	73	**14**	—
Shropshire	135	133	137	**17**	126	123	125	**16**	—
Western	256	251	258	**15**	240	234	237	**14**	*1*

* Excluding Cornwall. † Excluding Hants and Surrey.

TABLE I *Contd.—Population* (1891-1911) *of administrative Rural Districts.*

Administrative Counties.	*Population in 000's.* Population in aggregate of Rural Districts. 1891.	1901.	1911.	Density in 1911.	*Density: persons per 100 acres.* Population, after subtraction of mining, industrial and suburban areas. 1891.	1901.	1911.	Density in 1911.	Per-cent-age growth 1901-11.
Worcester	136	158	190	**45**	81	80	82	**23**	—
Warwick	140	150	172	**34**	97	96	101	**23**	—
Stafford	174	190	204	**33**	103	104	107	**20**	—
W. Midland	450	498	566	**36**	281	280	290	**22**	*3½*
Derby	202	234	272	**49**	68	67	70	**21**	—
Notts	112	119	129	**28**	63	62	64	**17**	—
W. Riding	272	311	383	**30**	165	174	181	**16**	—
Cheshire	160	163	183	**34**	113	110	116	**24**	—
Lancs	206	219	241	**34**	95	96	97	**18**	—
N. Midland and N.W.	952	1,046	1,208	**34**	504	509	528	**19**	*4*
E. Riding	93	92	95	**13**	90	87	89	**13**	—
N. ,, ...	138	133	137	**11**	133	127	128	**10**	—
Durham	279	316	401	**72**	30	31	31	**11**	—
Northumberland	109	115	125	**10**	84	84	84	**7**	—
Cumberland	107	101	101	**11**	103	98	98	**11**	—
Westmorland	39	37	37	**8**	38	36	35	**7**	—
Northern	765	794	896	**17**	478	463	465	**10**	*½*
Flint	50	51	58	**39**	41	42	45	**32**	—
Denbigh	85	91	95	**24**	37	36	35	**10**	—
Carnarvon ...	66	68	67	**20**	66	68	67	**20**	—
Anglesey	33	32	32	**19**	32	31	30	**18**	—
N. Wales	234	242	253	**24**	176	177	177	**18**	*0*
Merioneth	27	27	25	**7**	26	25	24	**7**	—
Cardigan	49	45	44	**10**	48	44	43	**10**	—
Montgomery	38	35	34	**7**	38	35	34	**7**	—
Radnor	18	18	17	**6**	16	15	15	**6**	—
Brecknock	35	37	42	**9**	29	28	29	**7**	—
Mid-Wales	167	162	162	**8**	157	147	145	**8**	*−1½*
Pembroke	53	51	51	**13**	51	49	47	**13**	—
Carmarthen	82	86	100	**17**	58	56	56	**12**	—
S. Wales	135	137	151	**16**	109	105	103	**12**	*−2*
Glamorgan	120	144	206	**63**	18	18	23	**19**	—
Total	**6,958**	**7,140**	**7,859**	**23·6**	**5.163**	**5,000**	**5,137**	**17·0**	*27*
Rest of England and Wales	**22,045**	**25,388**	**28,211**	**712·0**	**23,840**	**27,528**	**30,933**	**434·0**	*12·4*
Population of England and Wales	**29,003**	**32,528**	**36,070**	**96·6**	**29,003**	**32,528**	**36,070**	**96·6**	*10·9*

Throughout this paper a special grouping of counties has been adopted, partly geographical, partly with reference to the density of the rural population in 1911, partly with reference to the presence of great industries or the neighbourhood of London, and partly to make Table VI possible. In Hampshire and in Surrey the distinction between purely rural and other areas is so difficult to maintain that these counties are not included in the sub-total of Home Counties; and in Cornwall and Glamorgan there are so few rural districts unaffected by mining and quarrying that these counties also are treated apart. All (except Middlesex, which is treated as if it was wholly non-rural) are included in the total. The areas concerned are: rural districts before subtraction, 33,322,000 acres; urban districts, 4,016,000 acres. The area transferred from rural to urban is 3,100,000 acres.

While the aggregate of administrative rural districts in England and Wales has a density of 23·6 per 100 acres, that of our selected portions has a density 17·0. While the population of the former increased 2·7 per cent. in the period 1891–1901 and 10·1 per cent. in 1901–11, that of the latter *fell* 3·2 per cent. in the first period and rose only 2·85 per cent. in the latter. The population of the aggregate of the subtracted parishes increased 19 per cent. and 27 per cent. in the two periods, and so far as can be judged this growth was mainly due to industry, mining or suburbanity in practically all cases, though, as we shall see later, these were probably associated with some development of an agricultural nature; this rate of increase 1901–1911 is greater than in the urban districts as a whole or in any of the categories in Vol. I, page xvii, Table K, of the Census, where these districts are classified by population. It is then precisely in these dense rural districts that population has grown most rapidly in recent times.

The fall and rise of the population of the purely rural regions is apparent, though in varying degrees, in all the sub-totals, except the North Midland, where there is a double rise, and in Wales where there is no rise. The separate counties usually move in the same directions as the sub-totals, except where the changes are slight, the main exceptions to this rule are Sussex, Cheshire and Durham. Closer examination of the data shows that these movements are not the balance of contrary motions, but the resultant of similar movements of parts and of the whole.

In order to compare the movements of separate Rural Districts with that of the counties, Table II has been prepared.

TABLE II.—*Number of (modified) Rural Districts classified according to the change in population in* 1891-1901 *and* 1901-11.

The symbols "= +" mean "no substantial change in 1891-1901 and a rise in 1901-11," and similarly for the other headings.

	Number of districts where in the period 1901-11 there was an									
	Increase in population.			Stationary population.			Decrease in population.			Total
	++	=+	−+	+=	==	−=	+−	=−	−−	
Cornwall	1	1	0	1	1	3	1	0	6	14
Other S.W. ...	2	4	18	0	1	23	0	0	15	63
Hants and Surrey	12	5	7	0	1	0	1	0	0	26
Home	14	6	28	3	4	11	3	1	4	74
East	6	6	29	4	6	29	0	0	7	87
S. Midland	3	4	23	1	10	18	1	0	10	70
West	1	2	9	1	4	8	2	1	6	34
W. Midland ...	8	5	4	6	10	5	1	1	1	41
N.M. and N.W.	13	14	9	2	15	12	1	2	2	70
North	4	1	9	4	7	20	4	3	9	61
N. Wales	3	1	1	1	4	5	2	2	3	22
Mid ,, ...	1	1	1	0	5	9	0	2	8	27
S. ,, ...	1	0	0	0	2	4	0	1	4	12
Glamorgan	2	1	0	0	1	1	0	0	0	5
Totals	71	51	138	23	71	148	16	13	75	606

	No. of districts.	
	1891-1901.	1901-11.
Increased.		
Cornwall .	3	2
Rest of England	97	246
Wales	10	12
No change.		
Cornwall ..	2	5
Rest of England	113	205
Wales	20	32
Decreased.		
Cornwall ...	9	7
Rest of England	316	75
Wales	36	22
	606	606

Names of the 104 *rural districts included in the three columns in which a perceptible decrease took place in* 1901-11, *and approximate diminution of population (nearest hundred).*

Cornwall—	
Helston	5
Truro	16
Redruth	4
E. Kerrier	2
Liskeard	6
St. Germans	8
Launceston	3
Devon—	
Torrington	3
Crediton	7
Tiverton	2
Somerset—	
Langport	2
Wellington	2
Taunton	5
Bridgwater	2
Wells	2
Dorset—	
Cerne	2
Stourminster	3
Wilts—	
Cricklade	5
Malmesbury	2
Chippenham	2
Devizes	4
Warminster	2
Hants—	
Hartley Wintney....	2
Kent—	
Dartford	2
Faversham	10
Hoo	3
Sussex—	
Battle	2
Hastings	2
Bucks—	
Long Crendon	2
Newport Pagnell	2
Wing	2
Suffolk—	
Melford	4
Norfolk—	
Depwade	2
Walsingham	2
Lincoln—	
Welton	3
Horncastle	4
Louth	2
Caistor	2
Leicester—	
Blaby	2
Market Bosworth....	2
Belvoir	2
Northampton—	
Wellingborough	3
Hardingstone	2
Pottersbury	2
Towcester	3
Bedford—	
Eaton Bray	2
Biggleswade	5

Names of the 104 *districts in which a perceptible decrease took place—contd.*

Oxford—	
Thame	3
Gloucester—	
Chipping Sodbury	3
Hereford—	
Dore	2
Weobley	3
Bromyard	3
Kington	3
Shropshire—	
Ludlow	2
Teme	2
Clun	2
Cleobury	4
Chirbury	2
Warwick—	
Brailes	3
Stafford—	
Mayfield	2
Tutbury	2
West Riding—	
Sedbergh	2
Todmorden	5
Wharfedale	4
Wortley	10
Lancashire—	
Ulverston	7
North Riding—	
Aysgarth	2
Guisborough	4
Scarborough	2
Durham—	
Barnard Castle	5
Stockton	2
Northumberland—	
Glendale	2
Norham	3
Belford	2
Alnwick	3
Morpeth	2
Haltwhistle	4
Cumberland—	
Penrith	5
Brampton	3
Longtown	5
Westmorland—	
East	3
South	5
Denbigh—	
St. Asaph	2
Llanrwst	2
Carnarvon—	
Gwyrfai	16
Glaslyn	3
Geirionydd	4
Anglesey—	
Aethwy	3
Twrcelyn	2
Merioneth—	
Deudraeth	2
Dolgelly	2
Montgomery—	
Machynlleth	3
Newtown	2
Llanfyllin	3
Cardigan—	
Llandyssil	2
Aberayron	5
Aberystwyth	2
Tregaron	4
Radnor—	
Knighton	4
Pembroke—	
St. Dogmells	4
Haverfordwest	4
Pembroke	5
Carmarthen—	
Llanbyther	2
Llandovery	4

In the preliminary work for the tables the corrected populations of the Rural Districts were entered to the nearest hundred, so that a difference of 100 in two columns may be only the accident of the arithmetic. All differences which worked out as 0 or 100 have been ignored in Table II. It appears on examination that in most cases the great majority of the Rural Districts moved with their county and the corresponding sub-total. In England (excluding Cornwall) 316 out of 526 decreased in 1891–1901, only 75 fell further in 1901–11; of these 75 some are isolated, but the majority fall into four groups or lines—(i) from Torrington to Wells; (ii) from Warminster to Cricklade; (iii) the Welsh borders; (iv) the high moorland from Sedbergh to Norham. In Wales, especially mid-Wales, the fall continued.

Table III shows the change during fifty years, county by county, of the population on those areas, which were practically free of urban or mining population in 1911, and which could be followed back through the Census Reports. Comparison of Tables I and III shows that the latter has a deficiency in population counted rural of 550,000; most of these persons were on areas in the neighbourhood of urban disturbances, where boundaries had been so

TABLE III.—*Registration Counties after subtraction of urban and industrial regions.*

	000's.						Changes: Decrease –. No significant change =. Increase +.				
	1861.	1871.	1881.	1891.	1901.	1911.	1861 to 1871. Per cent.	1871 to 1881. Per cent.	1881 to 1891. Per cent.	1891 to 1901. Per cent.	1901 to 1911. Per cent.
Cornwall	165	160	139	128	122	120	–	–	–	–	–
Devon	257	249	233	226	212	214	–	–	–	–	+
Somerset	233	230	215	204	193	194	–	–	–	–	+
Dorset	116	116	108	103	94	95	=	–	–	–	+
Wilts	156	151	141	136	128	129	–	–	–	–	+
S.W. (exc. Cornwall)	762	746	697	669	627	632	–2	–7	–4	–7	+1
Hants	141	144	142	145	146	159	+	–	+	+	+
Surrey	41	44	46	50	55	61	+	+	+	+	+
Kent	167	177	180	182	178	184	+	+	+	–	+
Sussex	168	178	183	185	183	197	+	+	+	–	+
Berks	109	110	111	110	103	108	+	=	=	–	+
Bucks	80	81	74	75	72	75	+	–	+	–	+
Herts	80	81	77	76	72	75	+	–	–	–	+
Home (exc. H. and S.)	604	627	625	628	608	639	+4	=	=	–3	+5
Essex	171	171	159	157	152	162	=	–	–	–	+
Suffolk ...	219	214	203	196	183	185	–	–	–	–	+
Norfolk	273	265	260	256	245	249	–	–	–	–	+
Cambridge	111	114	106	103	100	105	+	–	–	–	+
Hunts	41	39	35	32	29	30	–	–	–	–	+
Lincs	268	268	258	240	227	233	=	–	–	–	+
E.	1,083	1,071	1,021	984	936	964	–1	–5	–4	–5	+3
Bedford	89	92	85	80	75	76	+	–	–	–	+
Leicester	81	78	78	75	73	76	–	=	–	–	+
Rutland	21	20	20	19	17	16	–	=	–	–	–
Northants	129	124	121	114	108	109	–	–	–	–	+
Oxford....	111	109	101	97	87	88	–	–	–	–	+
Gloucester	136	137	127	123	117	120	+	–	–	–	+
S.M.	567	560	532	508	477	485	–1	–5	–4·5	–6	+2
Monmouth	48	50	44	43	41	43	+	–	–	–	+
Hereford	85	85	79	74	71	69	=	–	–	–	–
Shropshire	152	154	151	145	142	145	+	–	–	–	+
W.	285	289	274	262	254	257	+1	–5	–4	–3	+1
Worcester	76	80	78	76	76	78	+	–	–	=	+
Warwick	103	106	106	101	97	101	+	=	–	–	+
Stafford	102	107	110	111	114	118	+	+	+	+	+
W.M.	281	293	294	288	287	297	+4	=	–2	=	+3·5

TABLE III.—*Registration Counties after subtraction of urban and industrial regions—Contd.*

	000's.						Changes: Decrease −. No significant change =. Increase +.				
	1861.	1871.	1881.	1891.	1901.	1911.	1861 to 1871. Per cent.	1871 to 1881. Per cent.	1881 to 1891. Per cent.	1891 to 1901. Per cent.	1901 to 1911. Per cent.
Derby	56	55	56	55	54	56	−	+	−	−	+
Notts	77	72	70	67	65	67	−	−	−	−	+
W. Riding	165	164	167	163	171	178	−	+	−	+	+
Cheshire	98	103	104	105	102	108	+	+	+	−	+
Lancs	108	105	106	103	101	103	−	+	−	−	+
N.M. & N.W.	504	499	503	493	493	512	−1	+1	−2	=	+4
E. Riding	94	93	92	87	83	86	−	−	−	−	+
N. ,, . .	135	137	133	124	118	120	+	−	−	−	+
Durham	40	42	37	36	35	35	+	−	−	−	=
Northumberland	99	94	91	85	84	84	−	−	−	−	+
Cumberland	99	99	101	100	95	95	=	+	−	−	=
Westmorland	38	38	38	38	35	35	=	=	=	−	=
N.	505	503	492	470	450	455	−4	−2	−4	−4	+1
Flint	29	32	33	29	31	33	+	+	−	+	+
Denbigh	39	37	36	33	32	31	−	−	−	−	−
Carnarvon	64	69	75	71	73	72	+	+	−	+	−
Anglesey	25	22	21	20	19	19	−	−	−	−	=
N. Wales	157	160	165	153	155	155	+2	+3	−7	+1	=
Merioneth	36	38	39	37	36	35	+	+	−	−	−
Cardigan	82	82	78	71	66	64	=	−	−	−	−
Montgomery	53	53	50	44	40	39	=	−	−	−	−
Radnor	13	13	12	11	11	10	=	−	−	=	−
Brecknock	37	35	34	32	30	31	−	−	−	−	+
Mid-Wales	221	221	213	195	183	179	=	−4	−8	−6	−2
Pembroke	55	52	49	47	45	44	−	−	−	−	−
Carmarthen	46	44	45	45	40	44	−	+	=	−	+
S. Wales	101	96	94	92	85	88	−5	−2	−2	−8	+4
England and Wales— Rural regions	**4,939**	**4,936**	**4,764**	**4,625**	**4,454**	**4,581**	=	**− 3·5**	**− 2·9**	**− 3·7**	**+ 2·9**
Industrial ,, *	15,127	17,776	21,210	24,378	28,074	31,489	+17·5	+19·3	+14·9	+15·2	+12·2
Total	**20,066**	**22,712**	**25,974**	**29,003**	**32,528**	**36,070**	**+13·2**	**+14·4**	**+11·7**	**+12·2**	**+10·9**

* All Middlesex and Glamorgan included.

altered as to make disentanglement impossible. The rural population as a whole was unchanged from 1861 to 1871, and then fell by three nearly equal steps, making 10 per cent. in all, between 1871 and 1901, and recovered one of these steps by 1911. The fall took place with little interruption throughout England, south of the Trent, except in six home counties; the population fell similarly in the counties further north than the West Riding of Yorkshire, in the counties on the Welsh borders and in eight of the twelve Welsh counties. In the remaining counties, influenced presumably by the neighbourhood of London, of industry, of mines or of quarries, notwithstanding that all the areas which were actually dense even at the end of the period had been subtracted, the movements were smaller and irregular.

The actual numbers (to the nearest 100 persons) included in the table are given in Appendix II for each Registration District for the years 1861, 1901, and 1911, together with the density in 1911. Of these residual rural populations in 477 districts, 354 decreased between 1861 and 1901, 111 increased, and 12 were equal at the two dates. The only districts showing an increase in 1861–1901 in the groups called South-Western, Eastern, South Midland, West, North, and in Wales (that is in those groups where the counties diminished steadily) were Plympton, Long Ashton (Bristol), Epping, Rochford, Mutford (Ipswich), Yarmouth, Erpingham (Cromer), St. Faith's (Norwich), Whittlesey, Blaby and Billesdon in Leicestershire, Northampton, Bridlington, Sculcoates (Hull), Middlesbrough, Guisborough, Darlington, Stockton, Morpeth, Carlisle, Cockermouth, Whitehaven, Bootle, Hawarden, Conway, Carnarvon, Festiniog, and Dolgelly, 28 in all out of 299. Of these the only one which is not near a large town or mining district is Whittlesey in Cambridgeshire. In the other groups, all containing industries on a large scale, the districts are divided nearly equally between increase and decrease in most counties and exactly equally (83 up, 12 level, 83 down) in the aggregate. It is thus seen that as a whole the movement in each county is not only the total, but is the type of the movements in its parts. The important conclusion that we reach is that however thoroughly we purify the population of urban and mining influences, we still find that the remaining population falls less or increases more in the neighbourhood of industry or residence. It is an important question which will be answered in part later on, whether this influence is an actual encouragement to agriculture from the neighbourhood of a good market, or is only a penumbra of the towns too thin to be identified by the statistical instrument we have used.

More detailed inspection of the numbers at each Census[3] in the districts shows other illustrations of this radiating urban influence, and also shows some definite geographical lines of division, other than county. Thus in Hampshire the rural population north of a line joining Fordingbridge to Farnborough has been practically stationary in all the districts throughout the half-century; south of this line it has increased. In Berkshire the districts east of Reading have increased, Bradfield, Newbury, Wallingford and Abingdon are nearly the same in 1911 as in 1861, while the western districts have decreased with the contiguous districts in Wiltshire. In the extreme north the population of the coast districts, east and west, has grown, while the moorland districts have fallen off. It is to be remembered that throughout reference is only made to the residual areas included in Table III.

The results obtained show some marked differences from those in Dr. Ogle's paper, "The alleged depopulation of the rural districts "of England," read to this Society in 1889, in which he maintained that the rural districts had contained a stationary population from 1851 to 1881. His method was to subtract from the total the populations of all urban districts containing 10,000 persons or more in 1881, and to treat the residue as rural; this residue in fifteen "chief agricultural counties" amounted to 2,381,000 in 1851 and 2,358,000 in 1881. If he had omitted Berks, Herts and Bucks, the fall would have been 3·6 per cent. instead of 1 per cent. Having the advantage of the 1891 and later censuses, I have been able to search more thoroughly for industrial influences, and it appears that in the residual treated by him there was a considerable decrease in the purely rural districts (which he noted in the case of certain counties) which was in fact balanced by the spreading of urban influences. These influences are subtle and gradual and at first difficult to recognise; but they are cumulative, and when we examine the history of a district that had become administratively urban in 1911 we find traces of its development as far back as 1871. Dr. Ogle did not, I think, use the test of density, or he would probably have remarked more explicitly on the growing intermixture of town and country in the industrial counties.

Table IV gives a view of rural population, similar in definition to Dr. Ogle's, and carried back to 1801 and forward to 1911. It differs from Tables I and III, in that on the one hand only those administrative Rural Districts, which in 1911 were very obviously industrial, mining, or suburban in character, were subtracted;

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[3] Not printed because of the size of the necessary table.

Table IV.—*Population on areas which were in Rural Districts, or Urban Districts containing less than* 20,000 *persons, in* 1911 (*less certain suburban and mining districts*).

[In 000's.]

Counties.	1801.	1851.	1861.	1881.	1901.	1911.
South-West	944	1,453	1,435	1,391	1,378	1,433
Hants and Surrey	216	358	388	484	613	749
Home	606	955	980	1,082	1,181	1,305
East	901	1,490	1,462	1,444	1,447	1,551
South Midland	556	806	811	812	800	835
West	268	360	375	373	360	377
West Midland	349	583	643	760	779	839
North Midland and North-West	660	1,021	1,078	1,368	1,716	1,998
E. and N. Ridings, Durham	286	459	508	600	665	788
Northumberland, Cumberland, Westmorland	219	307	312	329	322	336
N. Wales	158	284	296	328	351	371
Mid-Wales	170	253	254	252	228	228
S. Wales	153	254	260	290	326	406
England and Wales....	5,486	8,583	8,802	9,513	10,166	11,216

and on the other small country towns, which appeared to be simply market towns, and had a population of less than 20,000 in 1911, were added; the aggregate population of these towns in 1911 was about 1,800,000. These areas were almost certainly purely rural or dependent entirely on agriculture in 1861, and the growth from 1801–51, with the slight further addition in 1861, probably gives a true picture of the growth of rural England prior to 1861. But from 1861 to 1911 the further increase on these areas of 2,400,000 persons occurs entirely in the residential and industrial counties, and is not due to rural growth.

We conclude from the tables now given that the rural population increased some 50 per cent. in the period 1801–1851, was very nearly stationary from 1851 to 1871, fell 10 per cent. by 1901, and recovered 3 per cent. by 1911. The percentage changes depend on the definition adopted; but all reasonable definitions would give the same general impression and the same dates.

II.—*Land occupations.*

The analysis of agricultural occupations was carried out so thoroughly by Lord Eversley in his paper on "The decline in "number of agricultural labourers in Great Britain," read to this Society in 1907, that it will be unnecessary to go into much detail as to the nature of the classification. I have inserted the corresponding figures for 1871 and 1891 and carried his table (*Journal*

TABLE V.—*Land occupation. England and Wales. Men over 20 years.*

[Numbers in thousands and decimals of thousands.]

	All districts.						Rural districts.		Urban districts.	
	1861.	1871.	1881.	1891.	1901.	1911.	1901.	1911.	1901.	1911.
Farmers	226·0	224·5	202·4	200·5	202·0	208·1	174·3	179·3	27·7	28·8
Farmers' relatives	60·0	47·9	47·1	43·4	55·7	63·3	49·3	55·5	6·4	7·7
Bailiffs	15·6	16·3	19·4	18·0	22·4	22·0	19·4	18·8	3·1	3·2
Shepherds and labourers*	809·4	657·8	606·0	545·6	458·4	498·2	395·6	424·4	62·8	73·8
Gardeners, seedsmen, florists	(28·2)	(46·7)	(58·9)	(78·9)	105·4	121·5	46·1	48·3	61·3	73·3
Agricultural machines: proprietors, attendants	1·4	2·0	3·9	4·3	6·1	6·9	19·6	22·8	2·9	3·7
Others (including woodmen)	8·4	7·8	9·7	10·3	16·4	19·7				
Total	1149·0	1003·0	947·4	901·9	866·4	939·7	702·3	749·1	164·2	190·5
Domestic gardeners	(50·2)	(61·0)	(62·1)	(68·8)	75·2	100·6	41·2	58·9	34·0	41·7
Gamekeepers	9·4	11·8	11·3	12·7	15·1	15·5	13·8	14·2	1·3	1·4
Grand total	1208·6	1075·8	1020·8	983·4	956·7	1055·8	757·3	822·2	199·5	233·6
							Areas: thousand acres.			
Total (modified)	**1,180**	**1,049**	**1,020**	**983**	**977**	**1,056**	33,500	33,322	3,849	4,016

* Labourers include farm-servants, cottagers, those in charge of horses or of cattle, and possible other variants in nomenclature in the various censuses.

1907, page 275) on to 1911. In the earlier censuses domestic are not adequately separated from other gardeners, and I have followed Lord Eversley's hypothesis putting the figures affected in brackets; I have also added other occupations which definitely involve working on the land. Though it is reasonable to separate domestic from other gardeners for some classifications, they are in fact producing vegetables, fruit and flowers just as those employed by nurserymen or hired intermittently by householders. Gamekeepers are also definitely employed in charge of animals on the land, and may properly be included in the total of what I call land occupations. For the final total I have adopted Lord Eversley's modifications in subtracting an estimated number of retired persons prior to 1881 and adding a number for those absent in South Africa in 1901. It should further be remarked that the number of farmer's relatives (working on the farms) has so irregular a relation to the number of farmers as to make it almost certain that the content of the definition has varied.

The number of farmers is seen, when allowance is made for the "retired" included prior to 1881, to have remained practically unchanged for fifty years. It is very nearly equal to the number of holdings of over 20 acres in England and Wales estimated for 1895 by the Board of Agriculture. The number of shepherds and labourers declined rapidly from 1861 to 1901, the first and last steps being the greater. The cause and extent of the fall prior to 1871 has not, so far as I know, been completely analysed. The note below shows that a considerable part of it was apparent, rather than real, and due to faulty classification.

Note as to general and agricultural labourers.—General Report, Census of England and Wales, 1871, p. xlv.—"Notwithstanding the explicit instruc- "tions on the subject to the householders and the enumerators, it is not "improbable that many agricultural labourers returned themselves simply as "labourers; to enable the skilful inquirer to judge for himself we place the "facts in juxtaposition in the annexed table." [Abbreviated here.]

All ages.

[In 000's.]

	1851.	1861.	1871.
Agricultural labourers	909	914	765
Labourers (branch undefined)	324	307	509
	1,233	1,221	1,274
Shepherd (outdoor)	12,5	25,6	23,3
Farm servant (indoor)	189	158	134
General total	1,435	1,405	1,431

"Mr. Read, M.P., and Mr. Caird, good authorities, hold that there has been "a diminution of the number of agricultural labourers."

In the General Report, Census of 1881, p. 37, we find the above total for 1871 (with the addition of cottagers) corrected for retired persons, and compared with that for 1881 with the following result:—

All ages.

[In 000's.]

	1871.	1881.
Agricultural labourers, shepherds and farm servants	962	871
Labourers (branch undefined)	506	560
	1,468	1,431

In 1891, the general labourers were 594,000 in number; in 1901, 410,000; in 1911, 295,000, that is, fewer than in 1861.

The figures in this note refer to all ages and all districts in England and Wales. The disturbance of course affects town occupations, especially the

The total number of men over 20 years in agriculture was nearly the same in 1851 and 1861, the number for 1861 being 1½ per cent. less than in 1851. The subsequent general fall in actual agriculture was in part compensated by the increase in horticulture. While the number of persons classified as shepherds and agricultural labourers diminished by at least 40 per cent. in the period 1861–1901, the total in "land occupations" fell only 17 per cent. Since 1901 the shepherds and labourers, gardeners, machinists and others have together increased 13 per cent., and the whole in land occupations 8 per cent.

The increase in the number of "gardeners, seedsmen, florists" is very noticeable. In 1911 the total was made up as follows:—

	Urban districts.	Rural districts.	Total.
Nurserymen, seedsmen, florists	16,000	7,200	23,000
Market gardeners (including labourers)	12,400	18,500	31,000
Gardeners	34,900	22,600	68,000

The number of market gardeners is smaller than might have been anticipated. It is difficult to find in the Census of Occupations the persons who occupy the holdings of from 5 to 20 acres, which amounted to 127,000 in 1895.

building trades and works of construction, and in 1901 four-fifths of them were in urban districts. The following table gives the data for 1901 and 1911 when rural districts can be separated:—

Males over 20 years.

[In 000's.]

	Urban districts.		Rural districts.		All districts.	
	1901.	1911.	1901.	1911.	1901.	1911.
In Order VII. *Agriculture*—						
Shepherds	1	1	21	18	22	19
Men in charge of—						
Cattle	8	8	48	42	56	50
Horses	14	11	96	89	110	100
Agricultural labourers undistinguished	40	54	230	275	270	329
Total	63	74	395	424	458	498
In Order XXII. *Undefined*—						
General labourers	288	213	71	58	359	272
Grand total	351	287	466	482	817	770

The urban districts account, as would be expected, for a great part of the increase of gardeners of all classes, but it is at first sight surprising that the number of agricultural labourers has increased more rapidly in urban than in rural districts, even when allowance is made for the change in area. It is more surprising to find that, taking administrative Urban Districts as a whole and administrative Rural Districts as a whole, there are more farmers, more relatives, more bailiffs, more agricultural labourers,[4] and more "others" per 1,000 urban acres than per 1,000 rural acres. The latter it is true include the nearly unpopulated mountains and moorlands of Wales and of the northern counties, but the former include London. Just as we found that the rural population was denser and least inclined to fall in the rural regions which were in the neighbourhood of denser populations, so now we find that the agricultural population is denser and more inclined to rise in and among the denser populations. Actually the area covered by buildings in a modern extended County Borough is often not a great proportion of the whole; there is much space left for parks and gardens, and therefore many gardeners, and a considerable grazing and even arable area is included in its outskirts, together with regions of intensive cultivation. In the smaller towns and in the scattered mining and industrial urban districts, the houses of the industrial population may take up an almost negligible area, and agriculture flourish over the mines or round the factories undisturbed. The whole analysis strongly suggests that the number of persons occupied on the land in any place is determined to a great extent by the neighbourhood of a population not engaged in agriculture.

When we compare the changes in the rural population shown in Table III with the changes in the numbers in "land occupations," excluding now domestic gardeners, we find marked divergencies.

	Decennial changes.	
	Population.	Occupations.
	Per cent.	Per cent.
1861–71	0	−13
'71–81	−3·5	− 4
'81–91	−2·9	− 4
'91–1901	−3·7	− 3*
1901–11	+2·9	+ 6

* Not allowing for absence in South Africa.

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[4] Fewer shepherds and fewer gamekeepers.

The ambiguity of the Census returns of 1861 and 1871 for occupations does not nullify the fall, though it makes it probable that 13 per cent. is much too big; and it appears that there was an exodus of persons engaged in agriculture (at any rate from their occupations if not from their homes) prior to 1871, before the rural exodus had begun. We shall see immediately that this diminution was not confined to the young, but a considerable part may have been of men who went to the towns or abroad ahead of their families. Actually the number of boys and men engaged in agriculture was in 1911 53 per cent. of the number in all occupations in the aggregate of the rural districts of 18 counties selected as having very little urban disturbance, and was only 41 per cent. in all administrative rural districts in England and Wales. Occupied males form only 32 per cent. of the persons in rural districts. Hence a diminution of 13 per cent. of those occupied in agriculture would now make a difference of only 2 per cent. in the rural districts, if they left without any dependents. The discrepancy prior to 1871 is not then so great as appears. There is no inconsistency in the changes between 1871 and 1911. But it should be remarked that we have not so far had the reasoned report of the Census authorities as to 1911 occupations, but only an unannotated table. It is probable that the new form of schedule separating "industry" from "occupation" has resulted in a more rigid classification; and part of the rise shown in 1901–11 may prove to be only apparent, as suggested by the statistics in the note, pages 611–612.

In Table VI it is shown that the decline in the number of agricultural labourers took place all over England and Wales. Considerable difficulty was found in making this table. The Censuses of 1881 and 1891 make no distinction by age in the occupations in counties, and comparisons which do not separate the increasing numbers of boys at school from the totals are useless. These dates are therefore omitted. The classification for 1861 and 1871 is for Registration Counties, while that for 1901 and 1911 is for Administrative Counties, and the individual differences are so great as to prevent comparison county by county. But it was found possible to group counties as in the table, so that the group areas were very nearly the same numerically whether we took registration or administrative records. The actual places were not always the same; *e.g.*, administrative group F has 100,000 acres in registration groups A, C and I, while 115,000 acres in registration group F are in administrative groups C, G or H; the populations on these areas in 1911 were 23,000 and 26,000. On the assumption that such interchange has no important effect,

TABLE VI.—*Occupations in groups of counties. Men and lads* 15 *to* 65 *years.*

[00's omitted.]

Districts.	Farmers, relations and bailiffs.				Shepherds and labourers.				Together.			
	1861.	1871.	1901.	1911.	1861.	1871.	1901.	1911.	1861.	1871.	1901.	1911.
A. South-West	40,8	37,2	40,2	42,9	116,1	95,8	63,4	69,6	156,9	133,0	103,6	112,5
B. Hants and Surrey ...	6,6	6,0	6,5	7,4	41.2	37,8	24,2	26,6	47,8	43,8	30,7	34,0
C. Home	18,8	17,6	17,8	20,3	119,5	107,4	70,2	77,9	138,3	125,0	88,0	98,2
D. Middlesex	1,6	1,6	1,2	1,3	10,2	7,4	4,2	4,7	11,8	9,0	5,4	6,0
E. East	37,0	34,7	36,8	39,8	187,3	163,8	126,6	142,0	224.3	198,5	163,4	181,8
F. South Midlands ...	17,8	16,5	16,6	18,2	93,4	76,7	46,5	51,8	111,2	93,2	63,1	70,0
G. West	13,9	13,4	13,7	14,2	38,6	31,4	21,7	23,7	52,5	44,8	35,4	37,9
H. West Midlands ...	15,2	13,9	14,5	15,4	51,8	42,0	28,1	30,3	67,0	55.9	42,6	45,7
I. N.W. and Midlands...	60,4	55,8	74,2	74,6	113,7	83,6	87,1	94,0	174,1	139,4	115,2	119,2
J. North-East	18,5	17,5			40,9	33,7			59,4	51,2	46,1	49,4
K. North	14,4	12,8	13,4	14,0	25,5	20,9	14,7	15,0	39,9	33,7	28,1	29,0
L. Wales	43,1	40,2	38,3	40,0	51,5	39,3	31,2	33,0	94,6	79,5	69,5	73,0
Total (000's)	288,	267,	273,	288,	890,	740,	518,	569,	1,179,	1,007,	791,	857,

A. Cornwall, Devon, Somerset, Dorset, Wilts. C. Kent, Sussex, Berks, Bucks, Herts. D. Middlesex and London. E. Essex, Suffolk, Norfolk, Camb, Hunts, Lincs. F. Beds, Northants, Leicester, Rutland, Oxford, Gloucester. G. Monmouth, Hereford, Shropshire. H. Worcester, Warwick, Stafford. I. Derby, Notts, W. Riding, Cheshire, Lancs. J. East and North Riding, Durham. K. Northumberland, Cumberland, Westmorland. L. Wales.

In 1911 the County Boroughs are separated in the occupation tables from the administrative counties, and labourers are not distinguished; some approximation was necessary to allow for this.

it was found sufficient to add 1 per cent. and 3 per cent. to administrative groups C and G, and subtract 1 per cent. from group E to make them comparable with the registration groups, the other groups being unaffected. The ages 15–65 have been chosen so as to include the great bulk of those engaged in agriculture, while the confusions as to school-children and retired persons were to a great extent avoided.

Whatever uncertainty difficulties of classification may cause in the totals is minimised when we compare changes in one group of counties with those in another, as in Table VII, *et seq.*

TABLE VII.—*Comparison of changes in population, occupation and wages in groups of counties.*

Districts (as in Table VI).	Farmers and labourers* (15—65 years).		Shepherds and labourers only (15—65 years).		Rural population from Table III. Percentage changes.		Density of rural areas computed from Table I.	Money wages. Percentage change†	Average earnings,† including allowances, &c.	
	Percentage changes from Table VI.									
	1861-1901.	1901-11.	1861-1901.	1901-11.	1861-1901.	1901-11.	1891.	1861-1902.	1907.	
									s.	*d.*
A. S.W.	−34	+ 9	−45	+10	−19	=	18	+41	16	11
B. H. and S.	−36	+12	−40	+10	−11	+10	20	+31	18	1
C. Home	−36	+12	−41	+11	+ 1	+ 5	24	+31	17	5
D. Middlesex	−54	+11	−60	+10	....	...	....	+40	20	3
E. E.	−27	+11	−32	+12	−14½	+ 3	19	+14	16	6
F. S.M.	−43	+11	−50	+11	−14½	+ 2	22	+25	16	8
G. W.	−33	+ 7½	−43	+10	−11	+ 1	14	+40	17	8
H. W.M.	−36	+ 7	−46	+ 8	+ 2	+ 3½	22	+35	17	4
I. N.M. and W. ...	−33	+ 3½	−44	+ 8	− 2	+ 4	18	+39	19	9
J. N.E.	−21	+ 7			−11	+ 2	10	+35	20	2
K. N.	−30	+ 3	−40	+ 2	−10	=		+31	20	11
L. Wales	−26	+ 5	−40	+ 6	−12	=	12	?	18	0
England and Wales	−33	+ 8	−42	+10	−10	+ 3	....	+31	18	0

* Farmers, relations, bailiffs, shepherds, labourers.

† For detail and references see Appendix III, p. 645.

We exclude Middlesex from the discussion in the following paragraphs. The general uniformity of the rate of decrease of shepherds and labourers throughout the country is very noticeable. From 1861 to 1901 only in the East (32 per cent.) was the fall less than 40 per cent., and only in the South-West (45), the South Midland (50), and the West Midland (46) was it over 43 per cent. The rise 1901–11 is uniform (10 to 12 per cent.) over groups A to G, smaller (8) in the manufacturing groups H and I, smaller in Wales, and negligible in the North (K). With such slight variations in numbers whose possible error is so considerable it is unlikely that we shall find any clear connection with any other measurable characteristics of the groups. That no strict proportion can be found between what I have called rural population and the number of labourers is again shown by comparing the East with the South Midlands groups, or the West and West Midland. Nor does the fall appear to be related to the density, either towards making it more uniform throughout the country or less uniform.

Are the changes related to wages? In Appendix III is given a table of weekly money rates of wages in the counties at various dates from 1861 to 1907. Whatever their exact relation to earnings or to average wages, it is practically certain that they are definite enough to enable us to compare rates of change in the districts, as in Table VII. Again, whatever rule is suggested is contradicted by the contrary behaviour of the East and South Midland districts. The last column of Table III shows the computed annual earnings (divided by 52) estimated for ordinary agricultural labourers for the Wage Census (Cd. 5160). The greatest earnings are in the North (K) where the rise in the number of agriculturists in 1901–11 is least, the least in the East where the rise 1901–11 is greatest; but even this impetus towards lower wages is not general.

The purely statistical examination, without any reference to agricultural conditions, does not then show or suggest any explanation of the local variations in movement.

Without entering on any general discussion as to agricultural wages, I wish to point out that the average earnings of the aggregate engaged in land occupations have probably advanced more rapidly than would appear from the data in Appendix III or from other statistics generally quoted, for two related reasons. First, the continual growth of all the occupations dealt with in Table V other than ordinary farm labour has presumably resulted from a movement towards better wages. Secondly, the greater increase in number of nearly all land occupations in Urban than in Rural Districts has increased the proportion in regions where the pay is relatively high. There is no doubt that agricultural wages are in close sympathy with wages that can be obtained for unskilled labour in the same neighbourhood, and men cannot be kept on the land where the population is dense except at a wage approximating to a town wage. It may often happen (as is alleged) that the higher level is in part nominal rather than real, but at the least it must often mean that the labourer is obliged to pay for house accommodation of a type superior to that in rural districts and that his wages allow for this payment. How far real wages differ from nominal in this way must vary enormously according to the type of town or urban district; but I have little doubt that real wages for gardeners (nursery or domestic, or market gardening labourers) are definitely higher in urban districts than the wages of farm labourers in neighbouring rural districts. Now, in searching for typical agricultural wages, the last place an investigator would visit would be a farm within a county borough, and in general he would examine the more rural parts of a county. I think that this subject deserves careful investigation.

III.—*Ages.*

Volume VII of the Census of 1911 shows very clearly and completely the variety of distribution by age in England and Wales and the characteristics of urban and rural districts, and it further shows the marked change in general age-distribution that has taken place in recent decades. This report does not, however, deal with ages in relation to occupations, a subject deserving much more attention than has hitherto been given to it. I shall assume that those interested will refer to the Census volume for general population, and I shall deal mainly with occupied male population and in particular with the group shepherds and agricultural labourers.

TABLE VIII.—*England and Wales.*

*All occupied males.**

	Numbers (in 000's).						Percentages of total between 15 and 65.				
Ages ...	15—	25—	35—	45—	55—65.	Total. 15—65.	15—	25—	35—	45—	55—65.
1861...	1,800	1,380	1,125	835	555	5,695	31·6	24·3	19·7	14·6	9·8
'71....	1,965	1,569	1,214	947	624	6,319	31·2	24·8	19·2	15·0	9·9
'81†	2,224	1,797	1,379	1,020	648	7,068	31·5	25·5	19·5	14·4	9·2
'91....	2,617	2,049	1,571	1,142	690	8,069	32·5	25·4	19·5	14·2	8·5
1901....	2,910	2,443	1,889	1,341	808	9,391	31·0	26·0	20·2	14·3	8·6
'11....	2,981	2,793	2,296	1,639	972	10,681	28·0	26·1	21·5	15·4	9·1
	Agricultural labourers and shepherds.										
1861....	294·2	190·8	163·6	134·4	107·2	890	33·0	21·5	18·4	15·2	12·0
'71....	250·7	148·2	130·8	118·2	92·4	740	33·9	20·0	17·6	16·0	12·5
'81†	255·6	132·5	108·1	107·0	87·1	690	37·0	19·2	15·7	15·5	12·6
'91....	236·8	128·8	97·5	89·6	76·5	629	37·6	20·5	15·5	14·2	12·2
1901 .	181·8	102·6	93·2	76·7	64·0	518	35·1	19·8	18·0	14·8	12·4
'11....	201·4	117·7	96·9	88·5	63·6	568	35·5	20·7	17·0	15·6	11·2

* The residuals treated as Unoccupied vary in definition from Census to Census. No doubt after careful study these might be made uniform, but this has not been attempted here. In consequence, none of the figures depending on the "all occupied" table should be used except for such rough purposes as in this section.

† The Census gives groups 25—45 and 45—65; these have been sub-divided by interpolation.

Table VIII shows the numbers of all occupied males in five age-groups for 15 to 65 years from the Censuses of 1861 to 1911, both absolutely and in percentages; and the agricultural labouring group, classified as such in the reports, are dealt with in a similar way. By beginning at 15 years and stopping at 65 years we eliminate some of the difficulties of classification, and reduce considerably the disturbance caused by the inclusion of retired persons prior to 1881. The percentages are probably not much disturbed by the confusion between agricultural and general labourers. Looking first at the percentages, we see that in 1861 and 1871 the agriculturists show an excess under 25 and over 45 years and a deficiency in the middle ages; in 1881 the excess under 25 jumps up, and the deficiency from 25 to 45 is more marked. There is little change in the relations above 45 years throughout the fifty years. The excess of the young varies down and up from the high level of 1881 in a curious manner, and finishes with the maximum, 7·5 above the percentage of all occupied. No definite conclusion as to the nature of the change can be drawn from these figures alone, for they measure the balance of opposing tendencies. If an industry is decaying, and there is no movement of persons out of it, it is shown by a cutting off of the supply of young labour and a high percentage of old (see the diagrams in Booth's *Life and Labour of the People*), while if it is growing there is a high percentage of young. On the other hand, if the young enter the industry and after some years leave it, there is again a high percentage at the low ages, and if this continues the age-distribution remains distinct but constant. Again, if the death-rate in the industry is low, and if it can be carried on by elderly men, there will be a high percentage of the old. The figures are consistent with the hypothesis that young men left agriculture with acceleration about 1871, that the outward stream was regular and a steady age-distribution established for the following thirty years, and that in the last ten years a larger proportion remained up to the age of 25. We shall examine these hypotheses later.

It would be interesting to see how these movements affected the ages of the whole population of rural areas, and for this purpose we cannot depend upon administrative Rural Districts. Out of the English Registration Districts used for Table III those were selected from which no urban areas had been subtracted, for which no approximations had been made, and where there had been little, if any, change of boundary. It proved that only 29 districts satisfied these conditions, but that these were scattered in a fairly random way from the Scilly Islands to Belford in the extreme North. In Table IX the average of the percentage distributions by age of all males over 15 years is given, including those over 65.

TABLE IX.—*Twenty-nine registration districts, selected as being purely rural and subject to little change of boundary. All males.*

Average of the percentages in the districts.

Ages ...	15–25.	25—45.	45—65.	65—
1861....	27 ·4	36 ·4	26 ·0	10 ·2
'71....	26 ·9	34 ·9	26 ·7	11 ·4
'81....	28 ·3	34 ·2	26 ·3	11 ·3
'91.... ...	27 ·5	35 ·4	25 ·2	12 ·0
1901....	26 ·0	36 ·9	25 ·6	11 ·6
'11....	25 ·3	37 ·2	26 ·2	11 ·2

The selected districts are:—

- Kent, Hollingbourne.
- Sussex—
  - Hailsham.
  - Petworth.
- Hants—
  - Fordingbridge
  - Stockbridge.
  - Whitchurch.
- Cambridge, Caxton.
- Essex, Dunmow.
- Suffolk, Bosmere.
- Norfolk—
  - Aylsham.
  - Loddon.
- Wilts, Tisbury.
- Dorset, Beaminster.
- Cornwall—
  - Camelford.
  - Scilly.
- Gloucester—
  - Dursley.
  - Northleach.
- Hereford, Weobley.
- Shropshire, Market Drayton.
- Worcester—
  - Tenbury.
  - Pershore.
- Warwick, Shipston.
- Rutland, Uppingham.
- Nottingham, Bingham.
- Lancashire, Lunesdale.
- N. Riding—
  - Helmsley.
  - Aysgarth.
- Northumberland, Belford.
- Cumberland, Alston.

The movement here shown is quite different from that of agricultural labourers. The relative numbers between 25 and 45 years have risen over the whole period and those between 15 and 25 years

TABLE X.—*Age-distribution of various groups.*

Percentages of males over 15 *years.*

1901.

	Urban Districts.				Rural Districts.			
	15—25.	25—45.	45—65.	65—	15—25.	25—45.	45—65.	65—
All males	30 ·0	43 ·4	21 ·4	5 ·1	27 ·7	38 ·6	24 ·1	9 ·6
All occupied males	30 ·2	45 ·4	21 ·2	3 ·2	28 ·2	40 ·5	24 ·4	7 ·0
All occupied males in agriculture	22 ·9	35 ·0	31 ·2	10 ·9	27 ·1	35 ·8	27 ·1	10 ·1
Shepherds and labourers....	29 ·4	33 ·6	27 ·2	9 ·8	32 ·2	34 ·5	24 ·3	9 ·0

1911.

	Urban Districts.				Rural Districts.			
	15—25.	25—45.	45—65.	65—	15—25.	25—45.	45—65.	65—
All males	26 ·6	44 ·5	22 ·9	6 ·0	26 ·3	39 ·7	24 ·7	9 ·3
All occupied males	26 ·7	46 ·8	23 ·0	3 ·5	26 ·8	42 ·0	25 ·0	6 ·2
All occupied males in agriculture	25 ·2	36 ·3	29 ·4	9 ·1	28 ·1	36 ·0	27 ·1	8 ·8
Shepherds and labourers....	29 ·1	35 ·0	27 ·3	8 ·7	33 ·2	34 ·8	24 ·3	7 ·6

have fallen, and there are many minor differences. These figures may be compared with those in Table X. which exhibits the relationship of the percentages for the whole population (occupied or not) to those occupied in general, and in particular to all in agriculture, and to shepherds and labourers. The selected districts have relatively fewer young and below 45 years and more over 45 than the administrative Rural Districts as a whole, and the Rural Districts have fewer under 45 years than the Urban.

It is very noticeable that for all engaged in agriculture (including non domestic gardeners), and separately for labourers, the ages in Urban Districts are higher than in Rural Districts, though agricultural ages are still lower than those of all occupied in Urban Districts. Put otherwise, the migration from agriculture in Urban Districts, though considerable, is less than that from Rural Districts. This deserves more detailed examination, and we will investigate the age-distribution in 1901 and 1911 as minutely as the Census data allow. In Table XI the number of male persons occupied is shown for urban and rural districts separately year by year up to 20 years for 1911.

TABLE XI.—*England and Wales.*

1911.

Per 1,000 *of all ages above* 10.

Ages	10—	13—	14—	15—	16—	17—	18—	19—	20—	25 and upwards.
All occupied—										
Urban Districts	2	6½	19	24	26	26½	27	27	129	713
Rural Districts	1	7	21	26	28	28	28	27	123	711
Agricultural labourers and market gardeners*—										
Urban Districts	1	7½	21	27	31	31	30	29	122	700
Rural Districts	½	12	30	36	39	39	36	32	128	647

Per 100 *lads of* 14, 15, 16, 17 *of each group.*

Ages		18—25.	25—35.	35—45.	45—55.	55—65.	65—.
All occupied....		186	250	206	146	87	40
All occupied in agriculture (Order VII)	U.D.	167	186	172	162	128	91
	R.D.	143	150	135	124	90	70
Agricultural labourers and market gardeners*	U.D.	165	168	145	136	109	78
	R.D.	136	127	106	96	68	52

* Shepherds, agricultural labourers, market gardeners (including labourers) and woodmen.

TABLE XI *Contd.—England and Wales.*

Per 100 *men of* 25—35 *of each group.*

Ages	35—45.	45—55.	55—65.	65—.
All occupied	82·4	58·4	35	16
All in agriculture U.D.	92·5	87	70	49
All in agriculture R.D.	90	83	60	47
Labour group U.D.	85	80	64	77
Labour group R.D.	83	75	54	41

1901.

Per 1,000 *of all ages above* 15.

Ages	15—	20—	25—	35—	45—	55—	65—
All occupied	15·1	14·6	25·0	19·3	13·7	8·2	4·1
Shepherds and agricultural labourers	19·6	12·2	18·0	16·3	13·5	11·2	9·2

Per 100 *lads*, 15—20 *of each group.*

Ages	20—	25—	35—	45—	5—	65—
All occupied	97	166	128	91	54	27
Shepherds and labourers	63	92	83	69	57	47

Per 100 *men*, 25—35 *of each group.*

Ages	35—	45—	55—	65—
All occupied	77	55	33	16
Shepherds and labourers ...	91	75	62	51

It appears that the number occupied rises year by year of age till 18 in the urban districts, but is checked at 16 in the rural districts. In selected agricultural occupations the maximum number is reached at 16 or 17 years. The proportion under 20 years is much greater in rural agriculture than in urban agriculture.

We cannot, of course, follow these lads further through their career, but we can compare them with the co-existing older groups. In the second part of Table XI is shown the number of persons at higher age-groups per every 100 lads of ages 14 to 18, and we observe that for occupations in general there are 186 young men of 18 to 25 years and 250 of 25 to 35 years. In agriculture the numbers are very much lower, and are again lower in rural than in urban agriculture, and again lower in the agricultural labouring classes than in agriculture in general. We have thus localised the maximum movement as taking place from the age 17 years from the ranks of rural agricultural labourers. Following up the age-scale and starting afresh with 100 men of 25 to 35, we find part of the phenomena reversed; larger numbers are found in agriculture at all higher ages than in occupations in general; but still the relative numbers are larger in the urban than in the rural districts and for agriculturists in general than for labourers. It is thus suggested that the movement is over by 25 years of age.

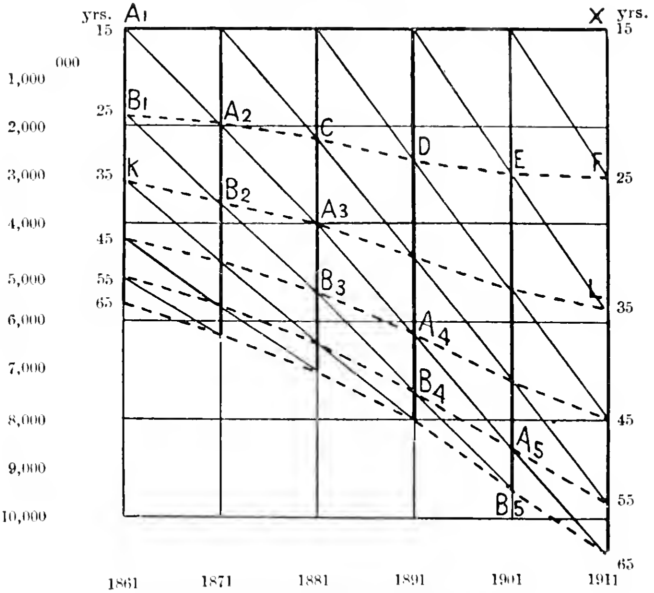
The last part of Table XI gives a similar analysis, less detailed for want of data, for 1901. The relations observable are similar to those in 1911.

An analysis of migration can be carried out with less detail for fifty years, where we can follow the generations throughout all or a great part of their working life.

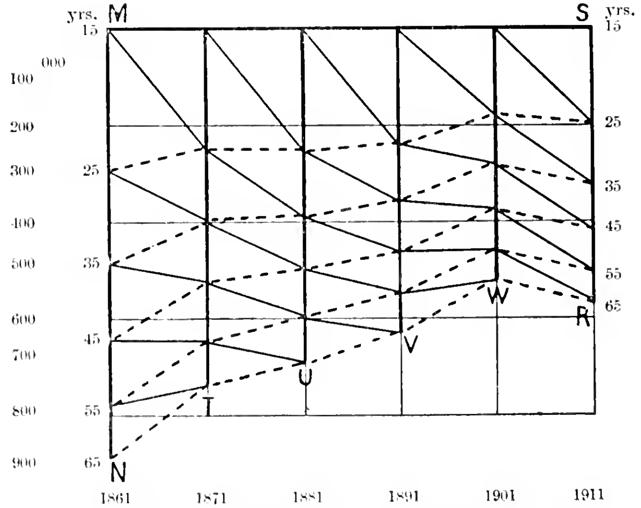
The actual numbers in Table VIII are shown in the diagram, which is in a form used by Dr. Cannan for a different purpose in the *Economic Journal*, 1895, page 509. The number of persons in each age-group in each Census year is shown on vertical lines. Then the position of the line B_1CF relative to A_1X shows the growth of the numbers of persons found at the ages 15–25 at successive censuses; the position of KL relative to BF shows the numbers at 25–35 and so on. At the same time we follow an actual generation as it gradually becomes extinct by the space between such lines as $A_1A_2A_3A_4A_5$ and $B_1B_2B_3B_4B_5$. Persons born between 1836 and 1846 were between 15 and 25 years old in 1861 (A_1B_1), between 25 and 35 in 1871 (A_2,B_2), and so on till they were over 55 in 1901 (A_5B_5), beyond which date they are not followed in the diagram. Of course, migration prevents the persons included in A_5B_5 being in every case identical with some of those included in A_1B_1. The second diagram shows on a tenfold vertical scale the movement of the numbers of the generations of agricultural labourers and shepherds as classified in the Censuses on precisely the same plan.

The correction suggested from the note on page 611 would diminish the total for agriculturists in 1861 and push the whole of the line NM together, but N would remain lower than T on the page; similarly it is possible that R ought to be pushed towards S, but it would still remain below W. The line from T to V would remain nearly straight, but should perhaps be lowered a little (*i.e.*, away from MS). Whatever modifications are made, the main differences between the two diagrams will remain and can easily be followed in detail.

England and Wales.



All occupied males (15 to 65 years).



Agricultural labourers and shepherds (15 to 65 years) as classified in the Census Reports.

If the data were more trustworthy, definite calculations could be made comparing the losses by death and by migration of each generation in each ten years; as it is the numbers given in the following table would probably be altered considerably, if men had throughout their lives returned themselves at the Census as agricultural labourers or throughout as labourers simply :—

TABLE XII.—*Agricultural labourers and shepherds. Survivors of decennial generations.*

1. Actually occupied in agriculture.
2. Number if diminution had been at same rate as that of all occupied males.
3. If loss had been due only to agricultural death-rate.* (Rough estimate.)
4. If diminution had been as all occupied males if their death-rate had been as low as that of agriculture.

[000's.]

Ages.		1871.				1881.				1891.			
		1.	2.	3.	4.	1.	2.	3.	4.	1.	2.	3.	4.
25—35	....	148	256	283	259	133	230	242	233	129	235	246	238
35—45	....	131	168	177	172	108	130	137	133	98	116	123	119
45—55	....	118	137	145	143	107	110	118	115	90	89	97	93
55—65	....	92	100	111	111	87	81	98	89	77	72	89	79
25—65	....	489	661	716	685	435	551	595	570	394	512	555	529

Ages.		1901.				1911.			
		1.	2.	3	4.	1.	2.†	3.†	4.†
25—35	....	103	221	229	224	118	180	182	182
35—45	....	93	119	122	123	97	101	98	104
45—55	....	78	83	89	87	88	82	86	86
55—65	....	64	63	77	69	64	55	66	60
25—65	....	338‡	486	517	503	367	418	432	432

* These columns are calculated roughly on the hypothesis that a generation aged, *e.g.*, 35–45 is subject for ten years to the average of the death-rates for farm labourers at the age-periods 35–45, 45–55. (Supplement to 65th Annual Report of the Registrar-General, p. cxxxv.) The death-rates for the years 1900–02 are applied for the last two dates, those for 1890–92 to the first three. The rates for 1880–82 (the earliest given) show so little difference that it was not worth while to introduce a new factor in so rough a calculation.

† An estimate is included for those absent at the war in 1901; 2 per cent., 5 per cent. and 1½ per cent are added to the numbers otherwise obtained for the first three age groups.

‡ *Not* including those absent at the war, perhaps 12,000.

Columns 1 in Table XII show the actual numbers of shepherds and labourers as given in Table VIII. Columns 2 show the numbers that would have been found if the agricultural generations had diminished in the same ratios as the all-occupied generations of the same age and date. Columns 3 show the numbers of agriculturists that would have survived if subject to no other loss than that in accordance with the death-rate stated in the Registrar-General's Supplements for their age and occupation; the effects of these rates have been computed very roughly. Each generation of all occupied is subject to a higher death-rate than that of agriculturists, and the excess of the numbers in columns 2 over columns 1 underestimates the movement from agriculture; those who succumbed to the less healthy conditions of other occupations should be counted as well as the survivors; this correction is attempted and leads to columns 4. Columns 4 are still below columns 3 in most cases from the effect of emigration out of England and Wales. An effort is made to correct the 1911 figures to include those who were absent in South Africa in 1901.

No stress should be laid on the numbers for 1871 separately till the question of classification in that year is decided; but when all allowances are made, the following statements are, I think, substantiated:—From some date subsequent to 1861 there was a very heavy exodus of men under the age of 35 from agricultural labour, nearly half of each generation leaving at some age between 15 and 35; the 1911 record shows a smaller loss. Up to the year 1901 from a fifth to a quarter of the men between 35 and 45 years was absent at each Census; these men left at some age between 25 and 45. In 1911 practically the whole of the corresponding group were present. At higher ages the numbers found in agriculture are a high proportion of the possible, increasing to the maximum possible by 1911.

Some part of the previous investigations could be extended to the separate counties if space permitted. I will only remark here on the varying proportions of young men to older in agriculture. In the aggregate rural districts of England and Wales 33¼ per cent. of shepherds and labourers over 15 years were in the age-group 15–25 years in the year 1911. The corresponding percentage in England varies from 23·2 (Surrey) to 53·9 (Westmorland). A low rate may mean either few lads starting in agriculture or few young men leaving it; a very high rate means a great exodus after the early ages. There is a marked but irregular geographical distribution as the following table shows:—

Table XIII.—*Number of shepherds and agricultural labourers of* 15 *to* 25 *years as percentage of all over* 15 *in these occupations in the aggregate Rural Districts of the counties of England,* 1911.

Southern counties.		Midland counties.		Northern counties.	
Surrey	23	Hereford	28	Shropshire	32
Kent	27	Worcester		Nottingham	36
Middlesex		Monmouth	30	Northumberland	38
Sussex	28	Gloucester		Lancashire	40
Essex		Warwick		Cheshire	41
Berks		Rutland		W. Riding	
Hants		Bedford	31	Derby	44
Herts	29	Northants		E. Riding	
Suffolk	30	Hunts	32	Durham	
Norfolk		Cambridge		N. Riding	46
Bucks		Leicester	33	Cumberland	52
Oxford		Lincoln	35	Westmorland	54
Wilts		Stafford	37		
Dorset	31				
Somerset					
Devon	34				
Cornwall	39				

IV.—*Summary.*

Evidently a great part of this paper is a re-hash of known statistics which have been subject to analysis again and again, and of that which depends on the Census of 1911 and is new, much will no doubt be dealt with in the final reports of the Census; but the importance of the subject justifies frequent return to it, and there are still several promising lines of investigation which may be pushed further, especially those which start from local and occupational age distributions and from density of population. Where so much is vague in definition, and where the classification is so imperfect that the Registrar-General of 1871 preferred the impressions of a competent observer to his own statistics, it is evident that very great caution must be exercised in drawing conclusions; and in so great a mass of tabulation, approximation and calculation there is room for undetected numerical errors. The following statements are not, I believe, vitiated by any of these considerations.

The influence of the towns and industrial districts is very penetrating and subtle, and the population of rural districts continually appears to increase from non-agricultural growth. When the effect of these influences is eliminated it is found that the rural (as distinguished from the agricultural) population diminished by some 10 per cent. between 1871 and 1901, and increased about 3 per cent. between 1901 and 1911. The fall and rise took place throughout the country, but the nearer the region to an industrial district the less was the fall. Some relatively small areas in England and a great part of Wales did not share in the rise.

The population in purely rural areas is not completely dominated by the number in agricultural occupations, and the number in agriculture does not move either in the country as a whole or in separate regions in strict proportion with the rural population.

The number occupied on farms suffered a great fall which began between 1861 and 1871 and continued to about 1901, even if we consider adult men only; there has been some recovery since 1901. The number of farmers has changed very little in 50 years. The number in horticultural and market gardening occupations has, on the other hand, grown throughout the period.

A considerable and growing proportion of persons occupied on the land is to be found in the Urban Districts, and the relative number of men in the prime of life is there greater than in the Rural Districts.

A very large number have throughout the last 50 years started their working life in agriculture and subsequently moved to other occupations in the country, in the towns or abroad. At present 17 years seems to be the critical age. There are indications that in the early part of our period many men must have left agriculture when no longer young, whereas in more recent times there is little movement after the age of 25 years. The exodus of young men is relatively greater in the Northern counties than in the South.

There is no evident connection between the numbers of agricultural labourers, or the changes in their numbers, on the one hand, and the changes of wages, heights of wages, the density of population, or the movement of other parts of the rural population on the other hand.

I have made no attempt to deal with the causes of these movements or to connect their variations with agricultural conditions; but I hope that I shall have made it easier for others to trace the influences of agricultural and land-holding developments both by illustrating the nature of the general statistics and by showing that the most interesting and important aspects of the problems in land-culture must be studied intensively and locally.

APPENDIX I.

Dense Rural Districts and Parishes.

The following list contains the names of the districts and parishes which are "rural" for administrative purposes but contain a large element of urban, military, naval, industrial or mining population, together with some whose natural population is disturbed temporarily by railway or other works of construction that cannot easily be eliminated. The names of the administrative Rural Districts are given in italics and of the civil parishes in ordinary type. Where no parish names occur, the whole district is dense. The list is made from the areas as constituted in 1911 (Cd. 6258), and names have been abbreviated when no ambiguity is caused. In I the parishes appear to be mainly affected by proximity to a town; in II by the presence of mines or quarries; in III by industries in localities not yet urbanised; in IV by military camps, works of construction, schools, and other causes of fluctuation; in V the cause of density was not ascertained. The lines of division are somewhat arbitrary, and some districts are disturbed from more causes than one, and further local knowledge would no doubt lead to alterations (especially in Class V). The density of a few of the subtracted parishes may be due to peculiarities of a purely rural nature, while on the other hand the following parishes, not included in the list or subtracted for the tables, are unusually dense. The difficulties occur principally in Kent, Essex, Leicestershire and Derbyshire, Cheshire and Bedfordshire.

Dense parishes not subtracted.

Alton; Grayshott. *Droxford;* Hambledon, Shedfield, Soberton, Swanmore. *Winchester;* Compton, Fair Oak, Wonston. *Ringwood;* Ringwood. *Wimborne;* Colehill, Hampreston, Verwood. *Horsham;* Billingshurst, Ifield. *Rochford;* Eastwood, Hadleigh, South Benfleet, Thundersley, Rayleigh. *Erpingham;* Holt. *Amersham.* Parishes in the following Rural Districts *other* than those named: *Ampthill;* Aspley Guise. *Biggleswade;* Arlesey. *Nantwich;* Audlem, Haslington, Shavington, Willaston. *Tadcaster;* Barwick, Kippax, Micklefield. *Hexham;* Broomley, Corbridge, Haydon, Wylam.

Dense parishes subtracted.

In each of the five lists the order of counties is that of Table I.

I.—*Suburban, residential and watering-places.*

St. Austell; Fowey. *Okehampton;* Okehampton Hamlets. *Bath. Keynsham. Long Ashton;* Long Ashton, Nailsea, Yatton.

Weymouth; Wyke Regis. *Poole;* Kinson. *Wilton;* Bemerton. *Chippenham;* Chippenham Without. *Basingstoke;* Worting. *Havant;* Farlington, S. Hayling. *Fareham;* Crofton, Cosham, Portchester, Hook with Warsash. *New Forest;* Dibden. *Isle of Wight. South Stoneham. Farnham. Egham. Epsom. Chertsey. Croydon. Godstone;* Warlingham. *Guildford;* Merrow, Pirbright. *Hambledon;* Haslemere, Witley, Shalford. *Reigate;* Betchworth, Horley, Nutfield, Merstham, Walton. *Elham;* Lyminge. *Sheppey;* Minster. *Bromley. Cranbrook;* Hawkhurst. *Dover;* St. Margaret's. *Thanet;* Birchington, Garlinge, Minster, Westgate. *Sevenoaks;* Edenbridge, Westerham. *Uckfield;* Crowborough. *Cuckfield;* Lindfield. *Hailsham;* Hailsham. *Bradfield;* Pangbourne, Theale, Tilehurst. *Cookham;* Bray, Cookham. *Easthampstead;* Crowthorne, Sandhurst. *Wallingford;* Didcot. *Wokingham;* Shinfield, Wokingham Without. *Amersham;* Chalfont St. Peter, Amersham, Great Missenden. *Eton;* Burnham, Datchet, Eton Wick, Farnham Royal, Iver, Langley Marish, Taplow. *Wycombe;* Chepping Wycombe Rural. Princes Risborough, West Wycombe, Hughenden, Wooburn. *Hitchin;* Knebworth, Letchworth. *St. Albans;* St. Peter Rural. *Barnet;* Totteridge. *Hatfield;* Bishop's Hatfield. *Ware;* Great Amwell, Stanstead Abbots, Wormley. *Watford. Welwyn;* Welwyn. *Romford. Orsett. Billericay. Stansted;* Mountfitchet. *Tendring;* Ramsey. *Ongar;* Chipping Ongar. *King's Lynn;* W. Lynn. *Chesterton;* Grantchester, Trumpington, Cherry Hinton, Milton. *Blaby;* Oadby, Kirby Muxloe. *Spilsby;* Sutton le Marsh. *Luton;* Leagrave, Limbury. *Peterborough;* Walton, Peterborough Without, *Witney;* Curbridge. *Woodstock;* Wolvercot. *Headington;* Cowley, Headington, Littlemore. *Cheltenham;* Prestbury. *Gloucester;* Barnwood, Churchdown, Hucclecote, Upton St. Leonards, Wotton St. Mary, Wotton Vill. *St. Mellons;* Rumney, Rogerstone. *Chepstow;* Caldicott. *Wellington;* Hadley, Wellington Rural. *Bromsgrove;* Clent, Hagley, Stoke Prior. *Evesham;* Broadway. *Kidderminster;* Kidderminster Foreign, Wribbenhall, Wolverley. *Solihull;* Packwood, Solihull. *Warwick;* Stoneleigh. *Coventry. Cannock;* Bushbury, Cheslyn. *Stafford;* Castle Church, Seighford. *Seisdon;* Codsall, Upper Penn, Wombourn. *Kingswinford. Walsall. Hayfield;* Mellor. *Norton. Knaresborough;* Killinghall, Pannal. *Chester;* Newton by Chester. *Macclesfield;* Taxal. *Runcorn;* Grappenhall, Stockton Heath, Latchford, Walton Inferior. *Wirral;* Bidston, Noctorum, Prenton, Heswall. *Hoylake. Escrick;* Water Fulford. *Flaxton;* Heworth, Huntington. *Sculcoates;* Sutton. *Middlesbrough;* Marton. *South Westmorland;* Arnside. *Valley;* Llanfaelog.

The whole of the administrative county of Middlesex has been excluded.

II.—*Mining and quarrying.*

Calstock; Calstock. *Liskeard;* Linkinhorne. *St. Austell;* Roche, St. Austell Rural, St. Blazey, St. Dennis, Tywardreath, St. Stephen. *Redruth. E. Kerrier. Clutton;* Clutton, Paulton, Timsbury. *Chippenham;* Box, Corsham. *Eastry;* Eythorne. *Dover;* Sibertswold, Ewell. *Ashby-de-la-Zouch;* Measham, Oakthorpe, Ravenstone, Swannington, Thringstone, Worthington. *Market Bosworth;* Bagworth, Barlestone, Desford, Ibstock, Markfield, Newbold Verdon, Ratby, Stanton, Thornton. *Lydney;* Lydney. *E. Dean;* E. Dean, Little Dean, Ruardean. *W. Dean;* W. Dean. *St. Mellons;* Machen U., Bedwas. *Oswestry;* Weston Rhyn. *Cleobury;* Highley. *Atherstone;* Ansley, Baddesley, Hartshill, Mancetter, Polesworth. *Foleshill;* Bedworth, Exhall, Foleshill, Keresley, Walsgrave, Wyken. *Meriden;* Fillongley. *Nuneaton;* Arley. *Tamworth;* Kingsbury, Wilnecote. *Cannock;* Cheslyn Hay, Essington, Great Wyrley. *Cheadle;* Cauldon. *Belper;* Smalley, Crich, Denby, Dethick, Duffield, Holbrook, Horsley Woodhouse, Kilbourne, Milford, South Wingfield. *Blackwell. Hartshorn;* Hartshorne, Overseal, Woodville. *Clowne. Chesterfield. Skegby;* Skegby, Sookholme. *Doncaster;* Adwick le Street, Askern, Conisbro', Denaby, Edlington, Owston, Skellow, Stainton, Carr House. *Hemsworth;* Ackworth, Brierley, Havercroft, Great Houghton, Hemsworth, Ryhill, Shafton, South Elmsall, South Hiendley, South Kirkby. *Kiveton Park;* Dinnington, Wales. *Thorne;* Thorne. *Wakefield. Rotherham;* Aston, Brinsworth, Catcliffe, Treeton, Glass Houghton, Bramley, Dalton, Laughton, Maltby. *Tadcaster;* Allerton. *Pateley Bridge;* Bewerley, High and Low Bishopside. *Whiston;* Bold, Ditton, Eccleston, Halewood, Rainhill, Whiston. *Patrington;* Kilnsea, *Guisborough;* Easington. *Stokesley;* Great Ayton. *Reeth;* Arkengarthdale. *Auckland. Chester le Street. Durham. Easington, Houghton le Spring. Lanchester. Barnard Castle;* Cockfield, Staindrop. *Stockton;* Cowpen Bewley, East Hartburn, Whitton. *Sedgefield;* Bishop Middleham, Chilton, Cornforth, Cherry Hill, Garmondsway Moor, Mainsforth, Sedgefield, Trimdon. *Morpeth;* East Chevington, Ellington, Longhirst, Pegswood, Woodhorn Demesne. *Castle Ward;* Black Callerton, Dinnington, Mason. *Haltwhistle;* Blenkinsopp, Haltwhistle, Hartleyburn. *Tynemouth. Brampton;* Midgeholme, Farlam. *Holywell;* Holywell Rural. Nerquis. *Wrexham. Dolgelly;* Talyllyn. *Aberystwyth;* Upper Llanfihangel. *Ystradgynlais. Llanelly;* Llanelly Rural, Llanedy, Llannon. *Llandilo Fawr;* Llandilo Rural, Quarter Bach, Bettws, Llandybie. *Carmarthen;* Llanarthney. *Llantrisant. Pontardawe, Swansea. Cowbridge;* Llanharan, Peterston. *Gower;* Llanrhidian Higher. *Llandaff;* Caerau, Lavernock, Leckwith, Lisvane, Llandaff, Llanedeyrn, Llanilltern, Llanishen, Llanvedw, Michaelston le Pit, Pentyrch, Radyr, Rhyd y Gwern, Rudry, St. Andrews, St. Fagans, Van, Whitchurch. *Neath;* Michaelston Higher and Lower, Llanwit Lower, Blaenhonddan, Coedffranc, Dyffryn, Dylais Higher, Resolven. *Penybont;* Coity Higher, Llangynwyd Lower and Middle, Newcastle Higher, Pencoed, Pyle, St. Bride's Major and Minor, Tythegston Higher.

III.—*Industrial.*

St. Austell; Mevagissey, St. Mewan. *Highworth;* Rodbourne Cheney, Stratton. *Chippenham;* Hardenhuish. *Winchester;* Twyford. *Hursley;* Chandlers Ford. *Strood;* Strood Extra. *Midhurst;* Linchmere. *Steyning West;* Upper Beeding. *Stony Stratford. Barnet;* Elstree. *Hemel Hempstead;* King's Langley. *Mutford;* Kessingland. *Walsingham;* Melton Constable. *Branston;* Boultham. *Glanford Brigg;* Ashby, Crosby, Barnetby le Wold, South Killingholme. *Grimsby;* Immingham, Little Coates. *Welton;* Saxilby. *Lutterworth;* Broughton Astley. *Melton Mowbray;* Asfordby. *Hinckley;* Barwell, Burbage, Earl Shilton, Stoney Stanton. *Daventry;* Woodford. *Wellingborough;* Wymington. *Kettering;* Burton Latimer, Corby, Loddington. *Warmley. Stroud. Halesowen. Yardley. Rugby;* Bilton. *Cannock;* Bushbury. *Stoke-upon-Trent. Repton;* Castle Gresley. *Shardlow. Basford. Stapleford. Newark;* Balderton. *Rotherham;* Thrybergh, Tinsley. *Leeds. Skipton;* Thornton, Coniston Cold. *Halifax. Keighley. Wharfedale;* Menston, Pool. *Hunslet. Bucklow;* Partrington. *Congleton;* Bradwall. *Northwich;* Lostock. *Disley. Blackburn;* Billington, Livesey, Mellor, Ramsgreave, Wilpshire, Yate. *Burnley;* Altham Briercliffe, Dunnockshaw, Foulridge, Hapton, Higham, Huncoat, Old Laund Booth, Read, Reedley Hallows, Sabden. *Preston;* Farington, Longton, Penwortham, Ribchester, Whittingham. *Barton. Bury;* Ainsworth, Birtle, Outwood, Unsworth. *Chorley.*[5] *Clitheroe;* Whalley, Wiswell. *Leigh;* Astley, Culcheth, Lowton. *Limehurst. Sefton.*[6] *Warrington;* Burtonwood, Great Sankey, Penketh, Poulton, Southworth, Winwick. *West Lancashire;* Aughton, Lydiate, Maghull, Melling, *Wigan.*[7] *South Shields. Sunderland. Hawarden;* E. and W. Saltney. *Haverfordwest;* Steynton.

[5] Except Rivington, Ulnes Walton, Welch Whittle.

[6] Except Kirkby, Sefton.

[7] Except Dalton.

IV.—*Miscellaneous (camps, schools, waterworks, &c.).*

St. Germans; Millbrook. *Chippenham;* Nettleton. *Malmesbury;* Hullavington. *Pewsey;* Ludgershall. *Amesbury;* Bulford. *Droxford;* West Meon. *Alton;* Selborne. *Fordingbridge;* Ashley Walk. *Hartley Wintney;* Cove, Crookham, Hartley Wintney, Yateley. *Andover;* Shipton Bellinger. *Petersfield;* Bramshott, Liss. *Horsham;* Horsham Rural. *Steyning West;* Lancing. *Abingdon;* Radley. *Hadham;* Much Hadham. *Mitford;* Bintree. *Culham;* Culham. *Chipping Sodbury;* Old Sodbury, Wapley, Winterbourne. *Magor;* Llanvaches. *Wigmore;* Burrington, Downton. *Warwick;* Hatton. *Chapel en le Frith;* Hope Woodlands, Bamford, Edale. *Bakewell;* Bradwell, Eyam. *Hayfield;* Hayfield. *East Retford;* Rampton. *Knaresborough;* Haverah Park. *Pateley Bridge;* Upper Stonebeck. *Penistone;* Langsett. *Garstang;* Barnacre. *Bellingham;* Rochester Ward, Troughend. *Cockermouth;* Castlerigg. *South Westmorland;* Preston Patrick. *Knighton;* Bleddfa. *Rhayader;* Llansantffraid. *Brecknock;* Cray, Cantref, Llanfrynach. *Haverfordwest;* Llanwnda.

V.—*Unclassified.*

Milton; Rainham. *Dartford;* Crayford, Darenth, Eynsford, Farningham, Horton Kirby,. Kingsdown, Longfield, Southfleet, Stone, Sutton at Hone, Swanscombe, Wilmington. *Malling;* Aylesford, Birling, Burham, Ditton, East and West Malling, East Peckham, Ightham, Offham, Ryarsh, Snodland, Wateringbury, Wouldham. *Hemel Hempstead;* Markyate. *Tendring;* Mistley. *Braintree;* Great Coggeshall. *Mutford;* Pakefield. *Plomesgate;* Framlingham. *Blaby;* Blaby, Cosby, Countesthorpe, Croft, Enderby, Glenfield, Huncote, Whetstone. *Castle Donnington;* Castle Donnington, Kegworth. *Biggleswade;* Sandy, Potton, Stotfold. *Barrow upon Soar;* Anstey, Barrow, Birstall, Mountsorrel, Rothley, Sileby, Syston. *Wellingborough;* Earls Barton, Irchester, Wollaston. *Feckenham;* Feckenham. *Tamworth;* Fazeley, Bolehall. *Cheadle;* Alton, Caverswall, Cheadle, Forsbrook. *Lichfield;* Armitage, Burntwood, Hammerwich, Whittington. *Newcastle-under-Lyme;* Betley, Keele, Madeley. *Tutbury;* Tutbury. *Glossop Dale;* Ludworth. *Southwell;* Lowdham, Southwell. *Barnsley;* Carlton, Notton, Woolley. *Penistone;* Cawthorne, Silkstone, Thurgoland. *Wortley;* Ecclesfield, Tankersley. *Bucklow;* Dunham Massey, Northenden, Styal, Timperley. *Chester;* Christleton, Great Boughton, Great Saughall, Upton. *Congleton;* Church Hulme, Church Lawton, Odd Rode, Wheelock. *Northwich;* Acton, Barnton, Comberbach, Moulton, Weaverham, Wincham, Winnington. *Runcorn;* Frodsham, Frodsham Lordship, Great Budworth, Halton, Helsby, Norley, Weston.

APPENDIX II.

Number of persons in the modified separate registration districts, as included in Table III, and the densities in 1911.

[00's omitted. Thus 2,4 means 2,400 persons.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
Cornwall—				
Scilly	2,4	2,1	2,1	**52**
Penzance	17,3	11,4	11,1	**27**
Helston	26,2	17,7	17,2	**24**
Truro	31,8	22,1	20,5	**23**
St. Austell	3,9	2,9	3,0	**19**
St. Columb	12,8	10,7	11,3	**15**
Bodmin	12,5	10,4	10,4	**12**
Liskeard	21,5	14,4	13,9	**15**
St. Germans	8,8	8,0	8,4	**23**
Launceston	13,7	10,2	10,0	**10**
Camelford	7,8	7,2	7,4	**14**
Stratton	6,3	5,0	4,9	**9**
Devon—				
Holsworthy	9,2	7,3	7,3	**9**
Bideford	8,2	6,4	6,3	**11**
Torrington	13,6	9,3	9,0	**11**
Barnstaple	20,3	17,8	18,2	**14**
S. Molton	15,5	10,8	10,8	**10**
Tiverton	19,0	15,3	15,1	**18**
Crediton	16,3	11,6	11,0	**12**
Okehampton	15,6	11,7	11,9	**16**
Tavistock	19,9	14,7	15,0	**10**
Plympton	14,6	19,2	19,9	**27**
Kingsbridge	14,4	11,4	11,7	**17**
Totnes	13,0	11,5	11,9	**13**
Newton Abbot	19,7	19,0	19,5	**20**
St. Thomas	31,0	24,7	25,0	**22**
Honiton	12,5	9,3	9,6	**13**
Axminster	14,5	12,2	12,3	**24**
Somerset—				
Williton	16,7	12,6	12,7	**13**
Dulverton	6,1	4,6	4,8	**6**
Wellington	12,4	9,4	9,2	**17**
Taunton	21,0	17,5	17,0	**24**
Bridgwater	21,8	18,4	18,1	**21**
Langport	18,0	13,5	13,3	**22**
Chard	15,7	13,4	13,4	**24**
Yeovil	20,1	16,2	16,4	**30**
Wincanton	19,7	15,9	15,9	**27**
Frome	13,4	11,1	11,2	**22**
Shepton Mallet	11,4	9,9	10,2	**22**
Wells	11,7	10,0	9,8	**17**
Axbridge	24,2	21,3	21,7	**25**
Clutton	11,0	9,1	9,7	**27**
Long Ashton	9,7	10,0	10,2	**28**

Persons in the separate registration districts, as included in Table III—contd.

[00's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
Dorset—				
Bridport	9,4	6,7	6,8	21
Beaminster	13,8	9,2	9,2	16
Sherborne	7,2	5,7	5,9	16
Dorchester	17,7	13,6	13,5	11
Weymouth	6,3	5,9	6,0	22
Wareham ...	13,0	10,6	10,6	12
Wimborne	14,2	13,4	15,0	19
Blandford ...	11,2	8,8	8,6	14
Sturminster	10,3	8,8	8,5	22
Shaftesbury	12,5	11,0	10,9	25
Wilts—				
Mere ...	7,1	5,2	5,2	16
Tisbury ...	9,9	7,7	7,8	18
Wilton	7,8	6,3	6,3	12
Salisbury	12,3	9,7	10,1	18
Amesbury ...	7,7	6,9	8,0	13
Pewsey	13,6	10,6	10,7	15
Warminster	9,8	6,3	5,9	11
Westbury ...	7,9	6,4	6,6	24
Bradford	5,6	5,1	5,2	31
Melksham	4,9	4,5	5,0	36
Devizes	14,7	11,9	11,5	18
Marlborough ...	5,3	4,4	4,5	10
Calne	5,8	4,6	4,6	16
Chippenham	11,1	8,1	8,3	22
Malmesbury ...	10,7	9,0	8,7	16
Cricklade	11,8	11,4	11,0	24
Swindon	10,0	9,3	9,5	21
Hants—				
Havant	1,3	1,7	2,0	37
Fareham	9	1,0	1,0	16
Lymington	7,6	9,4	11,9	32
Christchurch	9	8	8	—
Ringwood	5,5	6,2	7,1	19
Fordingbridge	6,4	6,1	6,3	17
New Forest	12,9	13,9	15,4	23
Romsey	6,6	6,2	6,8	22
Stockbridge	7,0	6,1	6,5	15
Winchester	9,5	10,2	11,3	16
Droxford ...	9,9	10,8	12,1	27
Catherington ..	2,5	3,1	3,7	28
Petersfield ...	7,2	9,1	10,8	24
Alresford	7,1	7,0	7,5	18
Alton	8,9	9,4	10,9	22
Hartley Wintney	9,5	10,2	8,9	21
Basingstoke	12,6	11,7	12,1	17
Whitchurch	5,5	5,8	6,1	19
Andover	10,0	8,8	9,2	15
Kingsclere	8,8	8,5	8,8	19

Persons in the separate registration districts, as included in Table III—contd.

[00's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
Surrey—				
Hambledon	19,3	25,5	28,2	**56**
Dorking	8,0	9,7	10,6	**27**
Reigate	5,0	6,1	7,1	**30**
Godstone	9,1	13,5	15,6	**37**
Kent—				
Dartford	1,9	1,8	1,9	**17**
Strood	8,7	13,8	14,6	**46**
Hoo	2,9	4,1	3,8	**39**
Malling	2,9	3,0	2,6	**22**
Sevenoaks	14,8	17,3	18,0	**34**
Tonbridge	9,4	12,7	13,1	**39**
Maidstone	15,7	15,6	16,4	**47**
Hollingbourne	13,6	12,5	12,8	**22**
Cranbrook	10,7	9,8	10,3	**30**
Tenterden	7,1	5,6	6,0	**16**
W. Ashford	8,1	7,6	7,7	**19**
E. Ashford	12,3	13,1	13,6	**25**
Bridge	10,1	9,8	9,9	**24**
Blean	6,9	7,0	7,4	**31**
Faversham	9,4	10,7	10,2	**26**
Milton....	6,4	8,5	8,5	**35**
Sheppey	1,5	1,3	1,2	**9**
Eastry	11,5	11,7	12,5	**30**
Dover	4,0*	3,9	5,0	**23**
Elham....	6,0	5,8	5,9	**18**
Romney Marsh	2,9	2,6	2,8	**9**
Sussex—				
Rye	8,2	7,2	7,2	**19**
Hastings	2,0	2,0	1,8	**18**
Battle	7,2	6,8	6,9	**18**
Eastbourne	4,2	4,9	5,4	**17**
Hailsham	11,5	11,5	12,1	**23**
Ticehurst	13,5	14,3	15,0	**29**
Uckfield	15,0	17,1	18,2	**25**
E. Grinstead	9,0	11,9	13,0	**28**
Cuckfield	9,9	13,1	13,7	**28**
Lewes	10,1	11,2	11,6	**23**
Newhaven	3,5	4,6	5,0	**20**
Steyning	6,7	8,1	8,6	**25**
Horsham	12,7	15,1	16,8	**25**
Petworth	10,1	8,5	8,8	**19**
Thakeham	7,9	7,3	8,3	**20**
E. Preston	4,8	5,7	6,9	**25**
Westhampnett	12,1*	13,9	15,6	**22**
Midhurst	12,2	13,2	14,2	**22**
Westbourne	7,0	6,8	8,3	**26**
Berks—				
Newbury	10,9	10,0	10,8	**25**
Hungerford	19,9	15,6	16,1	**17**
Faringdon	15,7	12,3	12,9	**20**
Abingdon	10,8	9,8	10,5	**22**

* Numbers asterisked have a large margin of error.

Persons in the separate registration districts, as included in Table III—contd.

[000's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
Berks—contd.				
Wantage	13.9	11.6	11.9	16
Wallingford	10.2	8.7	9,4	24
Bradfield	10.7*	11.4	11,6	20
Wokingham	6,7*	10.2	10,9	34
Maidenhead	3,8	3,7	4,0	28
Easthampstead	6,1	10.2	10,2	45
Bucks—				
Amersham	7.2	7,9	9.7	32
Eton	5.1	6,3	6.9	40
Wycombe	12.2*	10,6	10.8	23
Aylesbury	18,6	15.2	15.3	21
Winslow	9,3	7,0	7.0	20
Newport Pagnell	17.5	18.0	17.8	29
Buckingham	10,0	7.4	7.7	16
Herts—				
Ware	6,0	5,7	6,2	23
Bishop's Stortford	9,7	8.7	9,0	23
Royston	21,5	17.5	17,5	19
Hitchin	13,9	11,7	12,0	23
Hertford	7.8	7.5	7,5	22
Hatfield	3,0	3,5	4.0	28
St. Albans	7,9	8.7	10.2	31
Hemel Hempstead	3,6	3,0	3.1	21
Berkhampstead	6.1	5,5	5.5	26
Essex—				
Epping	5.6	6,8	7.1	24
Ongar	10.4	8.9	9.1	20
Chelmsford	22,1	20.7	22,8	27
Rochford	11,7	14,5	18.4	33
Maldon	17,3	14,6	16,1	20
Tendring	17,8	16,1	16,0	24
Lexden	20,0	18,5	19.7	28
Halstead	12,8	10,1	10.3	27
Braintree	19.0	15,5	16.0	27
Dunmow	19.8	15.7	16.1	22
Saffron Walden	14.2	10.2	10,3	18
Suffolk—				
Risbridge	15.0	11,1	11,3	22
Sudbury	22.6	17.9	17.4	23
Cosford	13,8	11,7	11,8	24
Bury St. Edmunds	18.2	11.5	11.4	17
Mildenhall	9,6	8.3	8,3	13
Stow	17,3	15,0	15.3	27
Hartismere	29,7	21,6	21.8	21
Bosmere	16.1	14.1	14,1	24
Samford	12,3	11.5	11.5	27
Woodbridge	16,2	14,6	15,4	21
Plomesgate	15.5	13,2	13.3	20
Blything	20,1	17,3	18,1	21
Wangford	5.6	4.7	4,8	16
Mutford	6,8	7,7	8,0	31

Persons in the separate registration districts, as included in Table III—contd.

[00's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
Norfolk—				
Yarmouth Flegg	8,2	9,2	9,9	**31**
Smallburgh	14,5	13,3	13,4	**21**
Erpingham	14,9	16,1	17,1	**27**
Aylsham	19,1	17,0	17,2	**25**
St. Faith's	9,3*	10,1	10,2	**21**
Forehoe	12,8	11,3	11,4	**30**
Henstead	11,3	10,4	10,3	**24**
Blofield	11,1	10,9	11,1	**24**
Loddon	14,2	12,4	12,6	**21**
Depwade	24,3	20,2	19,9	**25**
Wayland	16,2	13,8	14,1	**20**
Mitford	23,2	18,2	18,1	**18**
Walsingham	17,8	16,2	16,0	**21**
Docking	17,6	15,7	17,0	**19**
Freebridge Lynn	12,8	11,8	12,1	**16**
Downham	17,7	14,8	15,5	**19**
Swaffham	10,1	7,6	7,6	**10**
Thetford	18,2	15,8	15,9	**12**
Cambridge—				
Caxton	11,0	8,4	8,3	**16**
Chesterton	19,5	18,2	20,2	**29**
Linton	13,6	11,3	11,1	**22**
Newmarket	23,7	21,4	22,1	**23**
Ely	14,5	12,4	12,9	**9**
N. Witchford	4,7	4,7	5,2	**20**
Whittlesey	2,5	3,2	3,4	**13**
Wisbech	21,3	20,1	22,1	**22**
Huntingdon—				
Huntingdon	9,8	7,0	7,0	**12**
St. Ives	16,4	11,9	12,3	**21**
St. Neots	14,5	10,0	10,2	**16**
Lincoln—				
Stamford	10,3	8,3	8,6	**16**
Bourne	16,4	13,2	13,4	**16**
Spalding	13,4	12,4	13,2	**18**
Holbeach	9,4	8,2	8,6	**16**
Boston	25,2*	22,6	24,0	**23**
Sleaford	19,9	17,0	17,3	**13**
Grantham	17,6	15,4	15,0	**14**
Lincoln	23,9	21,4	22,7	**15**
Horncastle	18,8	13,5	13,1	**11**
Spilsby	25,8	19,9	20,2	**16**
Louth	23,7	18,6	18,3	**11**
Grimsby	5,3	5,2	6,0	**16**
Caistor	16,6	13,3	13,1	**11**
Glanford Brigg	21,9	20,0	20,9	**19**
Gainsborough	19,8	18,1	18,7	**17**

Persons in the separate registration districts, as included in Table III—contd.

[00's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
Bedford—				
Bedford	22.8	17,8	18,2	**19**
Biggleswade	21.0*	21.6	21,9	**41**
Ampthill	24.9	19.1	19.5	**29**
Leighton Buzzard	12,1*	9,6	9.1	**24**
Luton	8.3*	7,2	7,1	**22**
Leicester—				
Lutterworth	13.6	9.8	10,2	**19**
Market Harborough	13,1	11,5	12,0	**18**
Billesdon	5.1*	5.7	6.4	**18**
Blaby	6*	2,9	2.8	**17**
Hinckley	3,0	2.6	2,8	**29**
Market Bosworth	6.5	5,6	5,5	**16**
Ashby-de-la-Zouch	7.9	7.2	7,4	**25**
Loughborough	9,8	8,1	8,3	**22**
Barrow-on-Soar	6,6	6,4	6,6	**19**
Melton Mowbray	15,1	13,4	13,7	**15**
Rutland—				
Oakham	8,4	7,1	6.4	**11**
Uppingham	12.3	10,3	10,1	**20**
Northants—				
Brackley	8,1	6,1	6,2	**12**
Towcester	12,2	10,1	9,9	**25**
Potterspury	6,6	5,4	5,2	**26**
Hardingstone Northampton	13,1	13.3	13.3	**27**
Daventry	15,3	11,8	12.0	**21**
Brixworth	15,4	11,8	11,8	**19**
Wellingborough	6,8	6,2	6.8	**24**
Kettering	8,0	7,5	7,7	**18**
Thrapston	11,8	11,1	11,5	**24**
Oundle	11.7	8,1	8.2	**12**
Peterborough	20.3	16,7	16,8	**18**
Oxford—				
Henley	13.3*	11.2	11,9	**21**
Thame	14,4	10,3	9,7	**17**
Headington	5,1	4,2	4.2	**20**
Bicester	12,5	9,3	9,2	**16**
Woodstock	11.9	9,5	9,4	**20**
Witney	19,2	15.2	15,7	**21**
Chipping Norton	14.2	12.2	12,3	**18**
Banbury	20,1	15,6	15,5	**21**
Gloucester—				
Chipping Sodbury	18,4	16,7	16.3	**27**
Thornbury	16.7	15,4	15,1	**26**
Dursley	13.3	11,6	12.2	**45**
Westbury-on-Severn	3.8	3.3	3,3	**25**
Newent	10,9*	8,2	8,2	**20**
Gloucester	5.4	5,1	5,9	**28**
Wheatenhurst	7.7	6,0	6,0	**24**
Tetbury	4.6	4,1	4.2	**14**
Cirencester	14,4	12.1	12,7	**15**

Persons in the separate registration districts, as included in Table III—contd.

[00's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
Gloucester—contd.				
Northleach	10,9	8,1	8,1	**12**
Stow-on-the-Wold	8,0	6,8	7,1	**16**
Winchcomb	10,1	8,8	9,6	**17**
Cheltenham	3,3	3,3	3,5	**23**
Tewkesbury	8.9	7,3	7,4	**19**
Monmouth—				
Chepstow	11,3	10,4	10,6	**18**
Monmouth	13.3	10,6	10,9	**14**
Pontypool	13,9	11,3	12,0	**14**
Newport	9,7	8,4	9,7	**20**
Hereford—				
Ledbury	10,8	9,0	9,0	**18**
Ross	12,6*	10,3	10,4	**17**
Hereford	23,0	20,2	19.7	**14**
Weobley	9.0	7,0	6,7	**14**
Bromyard	9,1*	8,0	7,7	**13**
Leominster	9,9	7,5	7,5	**13**
Kington	10,9	8,6	8,1	**8**
Shropshire—				
Ludlow	11,0	11,5	11,2	**14**
Clun	8,8	7,1	6,9	**8**
Church Stretton	5,5	4,4	4.7	**10**
Cleobury Mortimer	8,1	8,1	7,7	**14**
Bridgnorth	9,7	8,4	9,0	**13**
Shifnal	9,0*	8,9	9.0	**19**
Madeley	6	5	5	**—**
Atcham	22,3	20,1	21,0	**17**
Oswestry	17,3	17,2	17,4	**22**
Ellesmere	13,5	12,5	13,0	**17**
Wem	8,7	8,3	8,3	**18**
Whitchurch	7,2	6,9	6,9	**20**
Market Drayton	14,2	13,8	14,6	**22**
Wellington	4,7	4,4	4,4	**17**
Newport	11,5	10,2	10,2	**22**
Worcester—				
Kidderminster	3,5	3,1	3,3	**19**
Tenbury	7,4	7,0	7,1	**19**
Martley	11,5*	12,0	11,9	**21**
Worcester	3	1,2	1,4	**28**
Upton-on-Severn	14,4	13,0	13,4	**27**
Evesham	8,5	9,1	10,6	**26**
Pershore	13,9	12,5	12,7	**24**
Droitwich	11,8	12,8	12,8	**24**
Bromsgrove	4,7	5,3	5,3	**23**
Warwick—				
Meriden	9,8	10,2	11,3	**26**
Atherstone	6,5	8,1	8,5	**56**
Nuneaton	1,3	1,4	1,5	**15**
Foleshill	1,1	1,1	1,1	**14**
Rugby	15,5	14,0	14.5	**19**
Solihull	5,9	6,6	7,3	**26**

Persons in the separate registration districts, as included in Table III—contd

[00's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
Warwick—contd.				
Warwick	5,1	8,6	8.9	21
Stratford-on-Avon	14.4	12,5	13.2	18
Alcester	13.0	9.6	9,6	20
Shipston-on-Stour	19.9	15,1	14,9	19
Southam	10.4	9,9	10,0	19
Stafford—				
Stafford	7.1	8,1	8.6	18
Stone	9.2*	13,8	14.3	21
Newcastle-under-Lyme	1.8*	1.7	1.6	16
Leek	12.3*	14,4	15.4	22
Cheadle	9.7*	10,0	10,0	27
Uttoxeter	11,7	10.7	10.9	17
Burton-on-Trent	16.6	20.4	20,7	27
Tamworth	5,6	5.8	6.7	21
Lichfield	10.2	13.3	13.5	22
Cannock	10.0	9.0	9.2	19
Wolverhampton	8,2	6,9	7,2	20
Derby—				
Shardlow	1.6	1,3	1,3	15
Derby	4	1,0	9	—
Belper	6,3	5.7	5,8	20
Ashbourne	16,7	14.5	14,2	15
Bakewell	18,8	16,5	17,7	22
Chapel-en-le-Frith	9.9	12.2	13.9	28
Glossop	2.3	2.4	2.3	14
Nottingham—				
E. Retford	14.6	13.0	13.2	15
Worksop	7,9	8.4	9,8	22
Mansfield	1,1	1,1	1.2	17
Southwell	20.0	15,0	15.3	14
Newark	17.7	13.7	13.5	15
Bingham	15,7	13,8	14,1	20
West Riding—				
Sedbergh	2,4	2,4	2.4	12
Settle	10,7	11.7	12.3	11
Skipton	17.9	17.8	17,9	13
Pateley Bridge	5,7	4.3	4.3	8
Ripon	8,9	7.3	7,6	11
Great Ouseburn	9,2	9,6	10,6	23
Knaresborough	5,6	4.6	5.0	14
Wetherby	15,0	13,9	14,4	23
Wharfedale	4,6	4,1	4,2	10
Todmorden	4,6*	5,1	4,5	22
Pontefract	8,2	9,5	10.6	29
Hemsworth	2,4	3.1	3,4	21
Barnsley	7	7	7	—
Penistone and Wortley	4,7	9,7	8,9	20
Rotherham	4.9	7,1	7.2	47
Doncaster	12.1	10.9	12,0	16
Thorne	9,9	9,1	9.3	19
Goole	9,4	8,9	9,5	23

Persons in the separate registration districts, as included in Table III—contd.

[00's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
West Riding—contd.				
Selby	10,2	8,9	9,2	**17**
Tadcaster	17,7	22,8	24,4	**35**
Cheshire—				
Macclesfield	17,0	15,5	16,0	**21**
Bucklow	10,3	10,1	10,1	**21**
Runcorn	9,4	8,8	9,4	**27**
Northwich	9,3	11,1	11,2	**25**
Congleton	5,0*	5,6	6,0	**19**
Nantwich	23,8*	23,2	25,0	**25**
Chester	15,8*	16,7	17,6	**21**
Wirral	7,0	10,6	13,1	**40**
Lancashire—				
W. Derby	1,8	1,6	1,5	**28**
Prescot	5,6	4,2	4,2	**28**
Ormskirk	16,6	12,8	13,2	**26**
Wigan	5	4	4	—
Warrington	1,7	1,9	1,7	**24**
Leigh	3	3	3	—
Bury	8	7	7	—
Burnley Clitheroe	17,2	14,5	15,5	**11**
Blackburn	3,3	2,6	2,5	**23**
Chorley	1,0	1,1	1,0	**18**
Preston	7,9	7,8	8,2	**20**
Fylde	7,8	10,3	11,5	**29**
Garstang	10,4	9,4	9,2	**17**
Lancaster	7,6	8,9	9,2	**17**
Lunesdale	7,5	6,9	6,9	**9**
Ulverston	18,5	17,7	17,0	**13**
East Riding—				
York	11,3	11,2	12,9	**18**
Pocklington	13,9	11,1	11,2	**10**
Howden	14,8	12,1	12,1	**16**
Beverley	11,3	10,4	10,7	**14**
Sculcoates	3,1	5,3	6,1	**36**
Patrington	8,9	6,9	7,1	**12**
Skirlaugh	8,6	6,4	6,5	**10**
Driffield	14,8	12,0	12,1	**11**
Bridlington	7,7	7,9	7,8	**12**
North Riding—				
Scarborough	9,3	8,6	8,6	**11**
Malton	15,3	11,8	11,9	**11**
Easingwold	12,0	9,9	10,2	**14**
Thirsk	13,1	12,7	12,8	**18**
Helmsley	11,8	10,0	10,0	**9**
Pickering	7,1	6 6	6,4	**8**
Whitby	9,5	8,0	8,5	**10**
Guisborough	5,4	7,3	6.9	**37**
Middlesbrough	5	9	1,7	**22**
Stokesley	10,0	9,5	9 8	**13**
Northallerton	9,2	7,6	7,8	**12**

Persons in the separate registration districts, as included in Table III—contd.

[00's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
North Riding—contd.				
Bedale	7,9	6.7	7,0	14
Leyburn	8,8	6,1	6.3	8
Aysgarth	5,6	4,5	4.3	5
Reeth	6	2	2	3
Richmond	9,2	7,8	8,0	10
Durham—				
Darlington	4.9	7,5	7.7	14
Stockton	2.1	2.2	2,0	10
Hartlepool	1.8	1.4	1.5	9
Sedgefield	1.8	1,8	1,9	7
Teesdale	14.8	12.9	12,2	7
Weardale	14.8	9,7	9,6	10
Northumberland—				
Castle Ward	8,8	7,5	8.6	10
Hexham	23.8	20,6	21.8	11
Haltwhistle	4.2	4.2	3.8	4
Bellingham	6,4	5,1	5.2	3
Morpeth	7,8	8,8	8,7	11
Alnwick	13,6	12,6	12,2	13
Belford	6,3	5,2	5.0	13
Berwick	8,6	6,1	5,8	12
Glendale	13,2	8,8	8,6	6
Rothbury	6,3	4.7	4,7	3
Cumberland—				
Alston	6,4	3,1	3,1	8
Penrith	11,9	10,4	9,9	6
Brampton	9,0	7.1	6,8	8
Longtown	10,5	6.7	6,2	7
Carlisle	14.8	16.7	16.7	25
Wigton	14.2	11.4	11.4	11
Cockermouth	18,3	20,8	21,5	15
Whitehaven	10,5	13.5	14,9	20
Bootle	3,7	5,3	5,0	6
Westmorland—				
E. Ward	12,9	11,0	10,8	6
W. Ward	7,4	6,5	6,4	5
Kendal	18,0	17,9	17,4	11
Flint—				
Holywell	28,9	18.9	19,6	33
Hawarden		12,0	13,8	47
Denbigh—				
Ruthin	12,4	9,2	9,1	10
St. Asaph	16,2	12,9	13,5	15
Llanrwst	10,2*	9,5	8,9	8

Persons in the separate registration districts, as included in Table III—contd.

[00's.]

	1861.	1901.	1911.	Density in 1911. (Persons per 100 acres.)
Carnarvon—				
Conway	6,0	7.8	9,0	**26**
Bangor	16 6	15,1	15,2	**19**
Carnarvon	23,9	32,9	31,2	**36**
Pwllheli	17,6	16.8	16,8	**18**
Anglesey—				
Anglesey	12.0	9,4	9,3	**17**
Holyhead	13,3	9,7	9,8	**17**
Merioneth—				
Ffestiniog	10,8	11,7	11,1	**9**
Dolgelly	6,8	7,1	6,8	**6**
Corwen	13,3	13,0	13.2	**11**
Bala	5,1	4,2	4,1	**4**
Cardigan—				
Cardigan	15,1	11,7	11,1	**14**
Newcastle-in-Emlyn	19,1	18,1	17,8	**16**
Lampeter	9,0	7,6	7,2	**10**
Aberayron	10.6	8,2	7,8	**12**
Aberystwyth	18,0	12,4	12,2	**11**
Tregaron	10,7	7,9	7,5	**6**
Montgomery—				
Machynlleth	8,1	5,2	5,1	**5**
Newtown	14,5	11,8	11,6	**7**
Forden .... }	30,2	23,1	22,6	**9**
Llanfyllin . . . . }				
Radnor—				
Knighton	9,0	7.3	6,6	**6**
Rhayader	4,4	3,5	3,7	**6**
Brecknock—				
Builth	7,9	7.2	7,8	**6**
Brecknock	10,8	8,3	8,3	**5**
Crickhowell	9,8*	7.1	7.7	**17**
Hay	9,0	7,7	7,5	**8**
Pembroke—				
Haverfordwest	24.4	19,2	18,7	**12**
Pembroke	9,6	8,8	8,4	**15**
Narberth	21,3	17,4	17,3	**14**
Carmarthen—				
Llanelly .... }	46,4	8,1	9.9	**45**
Llandovery .... }		7,8	7,4	**6**
Llandilofawr .... }		2.4	5,4	**10**
Carmarthen .... }		21,3	21,2	**14**

APPENDIX III.—*Details of Table VII.*

	Estimates of weekly money wages.												Percentage rise 1861-1902.	Earnings 1907.	
	1861.		1870.		1880.		1892.		1902.		1907.				
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*		*s.*	*d.*
Cornwall	9	6	11	0	13	9	14	0	14	6	15	0	*53*	17	7
Somerset	9	6	10	5	12	6	11	0	13	6	14	0	*42*	17	3
Devon	9	0	10	2	13	0	13	6	13	9	14	6	*53*	17	9
Dorset	9	6	10	1	10	9	10	0	11	11	12	1	*25*	16	1
Wilts	9	6	10	7	11	9	10	0	12	9	12	0	*34*	16	0
Hants	10	6	10	11	12	0	11	6	13	9	15	1	*31*	17	5
Surrey	12	4	13	6	15	6	15	0	16	4	16	8	*32*	18	9
Kent	13	6	13	7	15	9	14	6	16	4	16	4	*21*	18	10
Sussex	11	6	11	10	13	6	12	0	14	10	15	1	*29*	17	9
Berks	10	6	10	1	12	3	11	0	13	2	13	9	*25*	16	8
Bucks	10	8	12	10	12	9	12	4	14	8	14	10	*37*	16	11
Herts	10	0	12	7	13	6	11	6	14	8	14	8	*47*	16	10
Middlesex	12	9	12	2	15	0	14	1	17	10	18	7	*40*	20	3
Essex	12	0	11	6	12	6	11	6	13	9	13	7	*15*	16	4
Suffolk	11	6	10	11	12	6	12	0	12	9	12	5	*11*	15	9
Norfolk....	10	6	11	4	12	6	12	0	12	4	12	7	*17*	15	4
Cambridge	11	0	10	10	13	6	12	0	12	8	13	3	*15*	16	3
Hunts	11	0	12	0	12	6	13	0	13	8	13	5	*24*	16	2
Lincoln	14	3	14	0	14	3	14	8	15	6	15	3	*9*	19	5
Beds	11	6	12	3	12	6	12	6	13	6	13	9	*18*	16	3
Northants	11	6	11	10	13	6	14	0	14	1	14	6	*22*	16	9
Leicester	12	0	13	1	13	0	15	0	15	9	16	7	*31*	18	9
Oxford	10	8	10	10	12	9	12	0	12	0	12	11	*16*	14	11
Gloucester	9	6	10	9	13	3	10	6	12	11	13	11	*36*	16	3
Monmouth	11	6	12	11	12	0	12	6	16	6	14	9	*43*	18	1
Hereford	9	9	10	1	11	9	11	0	13	3	13	11	*36*	17	0
Shropshire	10	6	13	6	13	3	14	0	14	8	14	7	*40*	18	0
Worcester	10	0	11	9	13	0	12	0	14	2	14	6	*42*	16	3
Warwick	11	0	12	7	14	3	11	6	14	4	15	4	*30*	17	2
Stafford....	12	0	13	0	14	6	16	0	15	11	15	10	*33*	18	8
Derby	12	0	13	10	15	6	16	0	18	8	17	5	*55*	20	5
Notts	13	6	13	2	14	0	15	0	17	3	17	2	*28*	19	5
W. Riding	12	6	16	5	16	6	16	0	17	3	17	6	*38*	20	0
Lancs	13	0	15	0	17	6	18	0	18	10	16	2	*45*	19	10
Cheshire	13	0	13	6	15	4	15	0	17	0	16	7	*31*	19	0
E. Riding	10	11	14	11	15	0	15	6	16	9	16	5	*53*	19	3
N. Riding	13	6	15	4	16	6	15	6	16	9	16	9	*24*	19	7
Durham	14	3	16	0	—		—		20	0	—		*40*	21	9
Northumberland	13	6	16	7	17	0	17	0	19	4	—		*43*	21	2
Cumberland	13	6	14	9	18	0	18	0	18	4	19	3	*36*	20	5
Westmorland	15	9	16	1	—		—		18	4	19	1	*16*	21	2

The estimates for 1851, 1870, 1880, 1892 and 1902 are quoted from columns 10, 13, 16 and 17 of the table on pp. 704-7 in the *Journal* for 1898. Those for 1902 are from Cd-2376, and for 1907 from Cd-5460. The wages and earnings are in all cases those of ordinary agricultural labourers.

DISCUSSION *on* DR. BOWLEY'S PAPER.

SIR ATHELSTANE BAINES, in proposing a vote of thanks to the author of the Paper, said that the subject in hand was one which, as the author had well said, required intensive and detailed study, and it was here dealt with in a thoroughly statistical way. He joined heartily in the thanks the author said were due to the assistant who had so laboriously traced back the population of units through the complicated alterations of area which made the work unusually difficult in this country. Dr. Bowley was amply justified in the prudent reserve with which he put forward the conclusions he derived from the results of that compilation, conclusions which were welcome to all who wished for instruction in this interesting question of depopulation. To begin at the beginning, the distinction between urban and rural was one as to which no standard had been universally accepted. He thought that, on the whole, the author's selection of relative density was the best in the circumstances with which he was dealing. But even here the demarcation lacked definition in some cases, especially where one great branch of primary production, such as mining, competed with another, agriculture, and imparted a different character to the population. In this respect he thought that the author had conducted the process of elimination as effectively as it was possible to do. Another point was the overspill of urban population on to the adjacent country, and here, he heartily thanked Dr. Bowley for his invention of the very expressive and useful word "suburbanity." The Paper did not deal with the causes of this centrifugal movement, but he might mention, perhaps, the influence of the bicycle in importing labour into the smaller towns from distances not formerly accessible. Then, again, he had recently heard direct confirmation of the tendency, mentioned in the Paper, of sons of farmers and gardeners to forsake their paternal calling at the age of 17 or 18, for the more varied life in the town. In some cases they reappeared, if successful in life, as small holders. The evidence of the census as to occupation left him cold, as the author well knew. The detail involved was so minute and widespread that he had never been satisfied that the machinery of a general census was adequate to record it satisfactorily. The Census of Production, which was of a more specialised character, seemed to him to yield more useful results.

MR. REW, in seconding the vote of thanks, said that the Paper had struck him as one of the most sound and conscientious pieces of statistical work that the Society had ever had laid before it. But, to praise Dr. Bowley's statistical work was almost an impertinence, and to criticise it was almost an impossibility. He noticed that Dr. Bowley, with his usual modesty, spoke of it as to some extent a re-hash of old statistics. It might be quite true that a certain amount of material consisted of meat cut from an old beast. He would not say it had been freshly cooked because that was an ambiguous phrase, but at any rate it had been presented to them in a fresh and palatable way, which reflected the greatest credit on Dr. Bowley as a statistical *chef*. To make anything in the way of useful observation on such a Paper as this, representing such enormous labour and so much research, would involve if not equal research, at any rate a considerable amount of labour. The scientific basis which Dr. Bowley had adopted to solve the old difficulty of discriminating between rural and urban districts seemed to him the best. Density was the real test of what was or was not a rural district, and if for nothing else than the adoption of that basis and the working out of the figures on such a basis, the Paper would be memorable. He would make only one criticism of the figures and this was he thought not a criticism of Dr. Bowley but of Lord Eversley. In the addition made to the figures for 1901 for the absence of men in South Africa, he gathered Dr. Bowley had adopted Lord Eversley's figure recording the number of men absent as 20,000. He could not help thinking that, as Lord Eversley at the time admitted, this must be a low estimate; because not only must there have been a large number of the actual reservists or militia themselves absent, who, had they been at home, would have described themselves as agricultural labourers, but there must be a certain drain on the rural districts owing to the increased demand for labour in towns. Although they could not do more than speculate on what the figures should be, he ventured to say that the figure of 20,000 could not at any rate be an over statement but rather an under statement. The conclusion one was inclined to come to was, that on the whole there had been practically no increase in the number of agricultural labourers during the decade but that they remained about stationary. It seemed to him curious that with regard to farmers there should have been an increase of 8,000 in the course of twenty years, while as they knew the amount of land under cultivation had decreased. If he remembered rightly, the figures of the holdings themselves had also decreased. The description of "farmers" must always have a certain element of doubt in it. Only a day or two ago he had had an instance before him of a gentleman who described himself as solicitor and land agent and was also farming 200 or 300 acres. He wondered how he described himself in the Census. The land in this country was held and farmed to a very large extent by persons who had other occupations. Almost invariably the country auctioneer had a farm. A large number of people of that class also occupied land, and whether they returned themselves as farmers or whether they returned themselves as under the occupation from which they probably got the greater part of their income, he did not know. It therefore seemed to him that any conclusions drawn from variations in the number of farmers must always be open to considerable doubt. The discussion of the age-group figures seemed to him extraordinarily interesting, but he was bound to say he had not had time to consider them with the care they deserved. Dr. Bowley had drawn certain deductions from the changes in the age groups. What one would very much like to see if it were possible, and frankly he did not see that it could be possible, was some light thrown on the number of persons who left the agricultural labouring class and became farmers. He had not considered the subject sufficiently to know whether it was possible to gain any light on that subject from the Census returns, but if so it would be a fact of very considerable interest. At all times, and perhaps never more so than now, there had been a certain proportion of persons engaged on the land as labourers rising gradually through the small holding to the occupation of larger farms. That was certain; but the extent to which it went on nobody knew, and if census statistics under Dr. Bowley's able analysis could throw any light on that interesting subject, it would be of very great public interest.

Mr. MACROSTY said with regard to the adjustment which Mr. Rew had said should be made for the persons who were absent at the war in 1901–02, he would suggest that the note to Table XII to the effect that about 12,000 agricultural labourers over the age of 25 were absent at the war rather confirmed him in the suspicion he had always had that 20,000 was much too low an estimate for the total number of agriculturists absent at the war. Dr. Bowley on one or two occasions had raised the question as to whether the actual congregation of rural occupations in the neighbourhood of towns was due to the presence of a near and better market in the towns, or whether it was due to some more subtle influence of the town spreading itself over the adjacent countryside. He suggested it might be not merely the presence of a better market, but the presence of a market which entailed a more intensive cultivation in the neighbourhood of the town and therefore a larger proportion of persons engaged in rural occupations than in those districts which were more remote from the towns. He thought they would find some confirmation of that in Table V, where it appeared that gardeners, seedsmen, and florists in the urban districts had risen very much more rapidly than in the rural districts; and the relatively much greater rise between 1901 and 1911 in the number of farm labourers in the urban districts than in the rural districts might be connected with the prevalence of a good deal of dairy farming of the stall-fed character in the neighbourhood of towns. The thing one wanted to go into was the age classification, but it was impossible to do that by simply looking through the Tables at two or three moments' notice. He thought it was one of the lines upon which further investigation might most fruitfully be spent, because the two diagrams to which Dr. Bowley had referred to showed such a wide divergence between agricultural occupations and all other occupations that he was convinced a good deal of examination was required before they could be fully accepted.

Mr. Fay said such remarks as he had to make would not be on the figures, which he had not yet mastered, but on one or two points which he had followed up for himself on the lines suggested by Dr. Bowley at the end of the Paper, namely, a study of conditions in particular districts. He had derived from these the impression which, he gathered, ran throughout Dr. Bowley's statistics, namely, the extraordinary effect industry had upon the agriculture in its neighbourhood. It was obvious to anybody who made a tour of England how every region, especially the Midlands, was feeling the contact of the towns, and how local agriculture was always being threatened with revolution by the appearance of a coal mine or some new industrial works, so that the general position was one of instability. He himself had taken a number of villages in Gloucestershire and had found within that one county variations of wages almost as wide as those existing between the different parts of England; from 13*s*. in isolated villages to 21*s*. in the neighbourhood of Gloucester. The next point he had investigated was the wages on farms inside towns round about Liverpool. A few rural patches still remained, and it seemed to him that house rent was the predominant consideration. On one estate, such as Lord Derby's Knowsley Estate, the labourers had wages of 20*s*. with a cottage thrown in; but apparently the same sort of men worked in a neighbouring district on about the same wage with a house rent in some cases of 4*s*. 9*d*., in other cases of 5*s*., and even as high as 7*s*. 6*d*. These differences were hard to explain by differences in the quality of the housing accommodation. The higher rents seemed to be the result of pressure from other occupations on a limited supply of house room. The whole of the advantages of the higher wages in the North might thus be swallowed up in house rent. He thanked Dr. Bowley particularly for the encouragement which he gave to those who, not being fitted for work on big statistical lines, confined themselves to intensive local study in particular districts. He thought that a group of ten or twelve villages which had certain things in common —the neighbourhood of a great town, uniform geological conditions, or a common form of cultivation—would form good units of study. In conclusion he asked if there was anything in the suggestion that there was a considerable amount of land on the margin between arable and pasture, so that a farmer wishing to avoid a heavy wages bill would find it profitable to transfer a good deal of land from arable to pasture, thereby considerably diminishing his labour bill. He had heard it said that the farmers of Wilts and Dorset were proposing to take action on those lines to avoid the higher wages, which were now threatened.

Dr. Greenwood asked whether the criterion of density might not in such counties as Essex lead to difficulties of interpretation. Thus in such a neighbourhood as that of Epping, the districts thinly populated might nevertheless be really "suburbanised," the inhabitants being merely of a somewhat wealthier class than those residing near the railway; conversely some strictly agricultural districts in the more remote parts of the county, *e.g.*, in the neighbourhood of Thaxted, might be excluded although the density was merely the outcome of the presence of large villages which served as local clearing houses or of the development of the seed-growing industry as in the neighbourhood of Coggeshall.

Mr. VIGOR said he wished to supplement the suggestions made by Mr. Macrosty with regard to the reason for the larger density of farmers in urban than in rural areas. He said Dr. Bowley had made the rather startling observations on page 613 that there were "more farmers, more relatives, more bailiffs, more agricultural labourers and more 'others' per 1,000 urban acres than 1,000 rural acres." Mr. Macrosty had shown that the number of market gardeners had certainly increased to a great extent, and suggested that one reason for the greater density of farmers might be found in the number of dairy men and the number of persons engaged on intensive farming. He (the speaker) agreed that that was quite the most likely reason for the facts pointed out by Dr. Bowley. For instance, Lancashire he believed had more dairy cows than any other county in England, and of the agricultural population of Lancashire a much smaller proportion was found in the rural districts than was the case in other counties. Cheshire was a county of a similar character. Lancashire, Cheshire and the West Riding of Yorkshire were great potato growing counties and that was a kind of farming which involved a great amount of labour. He thought local inquiry on those lines would probably show that the suggestion of Mr. Macrosty accounted for the surprising difference in the density of farmers in urban and in rural areas.

Mr. FLUX said that in adding his congratulations on the very valuable mass of material Dr. Bowley had gathered together, he would like to congratulate him further on the indications afforded in the Paper of the stimulus he had given to certain students at the London School of Economics enabling him to enlist their assistance in certain parts of the work. He thought that kind of stimulus to others to start out on investigating work was possibly even more valuable than the gathering of a mass of varied material in a Paper of this class for reading before a Society like theirs. It was likely to bear much valuable fruit in the not very distant future. In reference to the tables of age distribution, he noted that Dr. Bowley gave a very necessary warning that they need to be studied with very great closeness; because any divergence in the percentage in any one age-group led to corresponding divergences in opposite directions in other age-groups. Looking for example at the table on page 618 and comparing the distribution of all occupied males in 1891 and 1911, in order to get rid of the awkward disturbance of 1901 and its possible effects even on all occupied males and their age distribution, one found that, although the figures all through as they stood suggested considerable differences, if they took those over the age of 25, the proportions of all occupied males were practically identical in the four groups above the age of 25 at those two periods, the whole of the divergence arising from the relative excess of young persons between the ages of 15 and 25 in those occupations in 1891 as compared with 1901. In the case of agricultural workers there was a divergence still remaining after taking account of the youngest age-group.

Mr. YULE said that he was in agreement with Dr. Bowley and previous speakers in holding that density was a correct criterion for judging districts as "rural." One naturally thought of a rural district as a district with a low density of population. Curiously enough Dr. Bowley had hit on the precise limit of density that he (Mr. Yule) took for the purpose of sorting out rural unions in the study of pauperism. If he remembered rightly, that limit was suggested to him by the density of the districts chosen for investigation as typical agricultural districts by the Labour Commission. They had a mean density of about 0·25 per acre, and a density of 0·3 included very nearly all of them. It must be noted that Dr. Bowley had gone rather further and had not used his criterion as an absolute criterion, but had used his judgment in including or excluding doubtful cases. The distinction between rural and agricultural districts seemed to him a very important one. One must remember that in dealing with a rural problem one was not necessarily dealing with an agricultural problem. The fact struck him very forcibly in considering the remarks made by Mr. Chambers in a Paper read at the Farmers' Club recently. When he went into some figures for the rural districts of certain counties which Mr. Chambers gave in a table showing the changes in population, he confessed he was very much puzzled by the facts. Taking a group of ten counties in which the population had either decreased or had increased only slightly, and in order to avoid difficulties about boundary changes taking those counties as a whole, he found that in six of them (Radnor, Merioneth, Cardigan, Montgomery, Carnarvon and Hunts) the number of males engaged in agriculture had gone up and the numbers that were engaged in other occupations had gone down, so it was not agriculture that was to blame in those chiefly rural counties at all. The facts as regards Hunts were especially striking; the number of males engaged in agriculture went up by 13 per cent. and the number of males engaged in other occupations went down by 2 per cent. In Norfolk the increase in the number of males engaged in agriculture was slightly greater than that of the number of males engaged in other occupations, and in Hereford the same was the case. Only in Cornwall and in Westmorland was the increase in the number of males engaged in agriculture slightly less than the increase in the number of males engaged in other occupations. He thought a study of the changes in the numbers of those engaged in agriculture and in other occupations in rural districts would be well repaid.

Dr. Bowley, in reply, said Sir Athelstane Baines was rather severe on the occupational Census, but very likely not more severe than they all were, especially all who spent much time on it. But even a faulty tabulation might have a use, and he did not see anything *a priori* in the description of a man as agricultural labourer or anything else, to vitiate the age distribution as between the agricultural labourers and other people. From that point of view he thought the occupational tables were free from errors which must certainly creep into any other tables relating to occupation, and he did not think the figures of age description had yet been studied sufficiently. He accepted Lord Eversley's statement with regard to the number of men at the war, but he had made slightly different estimates for the tables relating to ages when he was studying the expectation of survivals in agriculture. The number abroad in the Army, Royal Navy and Royal Marines together in 1901, of English or Welsh nationality, as tabulated in the General Reports of the Census was only 116,700 greater than the number in 1891. He did not really think that agriculture gave 20,000 out of those 116,700, even if one included the movement into the town and he was inclined to doubt the movement into the towns as being very important; because war or no war the one thing which must go on was the getting in of the crops and there were not too many men for the purpose in a normal year. So he was disposed to think himself that 20,000 was an over estimate, and would have given the figure much nearer 10,000 if he had not followed Lord Eversley's lines. He had nothing but agreement to offer with regard to what Mr. Macrosty and Dr. Greenwood had said. He was not able to follow in detail Dr. Greenwood's question, but he gathered it related to a county (Essex) with which his acquaintance was very limited, so limited that he had nearly planned a fortnight's tour last year to go and look at the towns and large villages and try to find out why the villages were so dense. As he could not do that he had put out of the map, as it were, those districts which were suspect of being influenced by London, and in putting out the districts he had not only to put out the industrial and commercial population, but also the agricultural labourers. That was done all over the country; but Essex was one of the counties mentioned in the appendix as of particular difficulty. When one came to look at the Tables to test the kind of effect made by excluding particular areas, which should have been kept in, very few tables would be found to be much altered; but he would be very glad to have any suggestions as to Appendix I with regard to the reasons why some of those places were dense, because although he could not re-cast the tables to include alterations, it was quite possible to make a note that these particular areas might be transferred.

The following Candidates were elected Fellows of the Society:—

John Baker.
J. W. Bispham.
Manmathanatu Ghosh.
E. B. Morris.
Manu Subedar.

ON THE USE OF ANALYTICAL GEOMETRY TO REPRESENT CERTAIN KINDS OF STATISTICS.

By Professor F. Y. EDGEWORTH, M.A., F.B.A.

(*Continuation.*)

SUBSECTION III.—VERY ABNORMAL CURVES.

THE class of abnormal frequency-curves which remains to be considered may be divided into two species according as the abnormality is due to the failure of one or other of the conditions which have been laid down in an earlier part of the section.* There may be an excess in (*a*) the absolute, or (*b*) the relative, magnitude of the given constants.

(*a.*) The constants β and ϵ are now supposed to overstep the limits of size imposed by common experience; while their *relation* continues to be such that the attribute of *unimodality* which so generally characterises concrete frequency-curves is still perfectly preserved. Consequently the coefficients λ and χ are no longer penned within the narrow field demarcated on a former page;† but are free to wander throughout the boundless plain which is contained between the (positive) axis of λ and the line through the origin inclined to the axis of χ at an angle of which the tangent is $\frac{1}{3}$.‡ To every pair of values for χ and λ there corresponds a value of β coupled with a value of ϵ. At any point in the plane (χ, λ) the magnitude of the corresponding β may be represented by a perpendicular height above the point, the magnitude of the corresponding ϵ by a perpendicular depth below. The ascending is matched by a descending ordinate. Like the Virgilian oak, "quantum vertice ad "auras Aetherias tantum radice ad Tartara tendit." Or rather, the Miltonian conception of a depth *thrice* as great as the greatest height seems appropriate here. That is the impression which I have received from a summary comparison of the two ordinates. But I have not thought it necessary to trace the surfaces accurately. The "dark unfathomed caves" formed by the lower surface remain by me unexplored. A stereogram of the *arêtes* and needle-points presented by the mountain range will not be offered here. I shrink from the labour of determining the *maximum* values of the constants (β and ϵ) in terms of the co-ordinates (χ and λ) with which they are connected by the fundamental equations. It must suffice to find a limit to the *greatest possible* magnitude of the constants consistent with the proposed construction; or at least of one of them, the one which seems to admit of the largest values.

A superior limit to the constants β and ϵ may be obtained from the consideration that the value of each must always be such that when those values are substituted in the fundamental equations, it shall be possible to find a value of χ which is real and positive. To begin with the simpler, the second, equation: it may now be written $\chi^2 (\epsilon - 1) + 2\chi (\epsilon \text{R} - \text{S}) + (\epsilon \text{R}^2 - \text{T}) = 0$.* When ϵ is greater than unity, the coefficient of χ^2 is positive. The absolute term becomes positive for all (positive) values of λ, when ϵ becomes equal to or greater than 3·6. For the term may be written:—

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* *Ante*, p. 308.

† *Ante*, p. 423.

‡ *Ante*, p. 417.

$$\lambda^4\left(\epsilon\frac{225}{16} - \frac{405}{8}\right) + \lambda^3\left(\epsilon\frac{45}{2} - \frac{135}{4}\right) + \lambda^2\left(\epsilon\frac{33}{2} - 9\right) + \lambda(6\epsilon - 1) + \epsilon.$$

Whence it appears that as long as the coefficient of λ^4 remains negative it is possible by assigning a sufficiently high value to λ to secure that the term should be negative. But as soon as $\epsilon\frac{225}{16} - \frac{405}{8}$ becomes = or > 0, that is as soon as ϵ = or > 3·6, then, since all the other terms for all positive values of λ (with of course positive values of ϵ) are positive, the whole term must be positive for all positive values of λ. Likewise the coefficient of 2χ, viz.,

$$\lambda^2\left(\frac{15}{4}\epsilon - \frac{45}{2}\right) + \lambda(3\epsilon - 9) + (\epsilon - 1),$$

becomes and continues positive as soon as ϵ has become and passed 6. But when all the coefficients of the quadratic equation for χ are positive, there can be no positive root to the equation. Thus 6 forms a superior limit to the value of ϵ.

A nearer limit may be obtained by utilising the condition that χ is (not only not negative, but also) not *imaginary*. Consequently, $(\epsilon\text{R} - \text{S})^2 - (\epsilon - 1)(\epsilon\text{R}^2 - \text{T}) \overset{=}{>} 0$. Put the expression on the left, in the form $\text{A}\lambda^4 + \text{B}\lambda^3 + \text{C}\lambda^2 + \text{D}\lambda + \text{E}$; and consider the coefficient of A. It is $\left(\frac{15}{4}\epsilon - \frac{45}{2}\right)^2 - (\epsilon - 1)\left(\epsilon\frac{225}{16} - \frac{408}{8}\right)$. Expanded, this comes to $\frac{-\epsilon\, 1665 + 7290}{16}$. Thus A is negative for all values of ϵ above 7290/1665 = 4·38 nearly. But for that value and all higher values of ϵ, it is found that all the other coefficients of the above-written expression, which is not to be less than zero, are negative. For example,

$$\text{B} = 2\left(\frac{15}{4}\epsilon - \frac{45}{2}\right)(3\epsilon - 9) - (\epsilon - 1)\left(\epsilon\frac{45}{2} - \frac{135}{4}\right).$$

This reduces to $\frac{-585\epsilon + 1485}{4}$; which is negative for values of $\epsilon > 2·55$.

The limiting value of ϵ which has thus been found, nearly 4·38, may be combined with a value of λ such that the resulting quadratic for χ has a real and positive root. Here then we may seem to have touched bottom—not merely a limit below the lowest depth. We have only to assign an appropriate value of λ, thence deduce to corresponding value of χ, and with the values of χ and λ to form the value of β. I have been unable, however, to arrange a pair of values for χ and λ (combined with the limiting value of ϵ), which does not markedly violate our condition *b*.* The point proposed lies far outside to the right of the limiting line $\chi = 3\lambda$.

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* As to the signification of these symbols, see *ante*, p. 307.

I have sought a more useful limit for ϵ by determining the value of λ, for which ϵ is a maximum, *subject to the condition* that $\chi = 3\lambda$. Substituting 3λ for χ in the fundamental equation II, and differentiating with respect to λ, I find for the differential coefficient which is to be equated to zero—

$$7 + 102\lambda + 435\lambda^2 + 675\lambda^3 - 25{\cdot}4625\lambda^4.$$

This expression becomes zero for a value of λ between 27 and 28. On from that limit to $\lambda = \infty$ the expression continues to be positive, and back from that limit to $\lambda = 0$ the expression continues to be negative. At that limit then there is a unique maximum of ϵ.

The value of ϵ for the round numbers $\lambda = 27$, $\chi = 9$, and presumably also for the more exact limit is in the neighbourhood of 3·6. This, it may be remarked, is the depth of another cavity underneath the available portion of the plane (χ, λ); the value of ϵ when $\chi = 0$, $\lambda = \infty$, viz. $\frac{405}{8}\Big/\frac{225}{16} = 3{\cdot}6$; corresponding to the (Pearsonian) $\eta = 43{\cdot}2$.

What is the very greatest value of ϵ occurring within the delimited area? I am not careful to answer this question, considering the slight statistical interest which attaches to it. For indeed the vast region which we are now exploring is but sparsely populated with concrete instances. I have met with only one or two examples of η-coefficients so enormous as those which we have been considering. There are the not very typical statistics given by Dr. Georg Duncker for the frequency of an organ ("Armzahl") in certain South Polar species,† viz.:—

4	*5*	*6*	β_2
6	582	12	33·13
5	895	5	128·48

The three (italicised) figures in the first row denote (as I understand) magnitudes of the quantity under observation, the "Armzahl"; each of the other rows denotes the frequency with which each magnitude is observed to occur together with the value of the coefficient β_2, deduced from the relative frequencies.

It will be remarked that the second at least of these instances far transcends the limits which are imposed by our construction on the size of η. And there is nothing in mathematics at least, if not in nature, to prevent the inadequacy of our construction appearing more marked. For clearly it is possible to conceive frequency-curves characterised by any degree of *lepto-kurtosis* (in Professor Pearson's phrase). They might be fabricated, for instance, by

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* *Ante*, p. 308 and p. 417.

† *Biometrika*, vol. viii, p. 238.

translating a normal frequency-curve, of which the abscissa is ξ, into a curve with abscissa X, where $X = a\xi^{2m+1}$. By taking m sufficiently large it may be secured that the coefficient

$$\beta_2 (= 3 + \eta = 3 + 12\epsilon), = \mu_4/\mu_2^2,$$

should have *any* degree of magnitude. It is not, I think, a serious objection to our method that it is inapplicable to such very abnormal and very unusual cases.

Having regard to fact and practice, I will not dwell at equal length on the investigation of the greatest possible value for the constant β. Suffice it to say that by parity of reasonings I have found possible values of β well above unity, but far below the largest values which I have found for ϵ. I forbear to deal at greater length with cases which seem to be, in the weighty phrase of Newton, "rather mathematical than natural." *

(*b*) I pass on to the second kind of abnormal frequency-group. In order to classify the varieties of this kind let us define more carefully a limit which it sufficed to mention in the preceding subsection.† I mean the locus of values for χ and λ, such that the cubic equation which gives the *stationary* points for the ordinate of constructed curve has two equal roots; the limit at which that equation just ceases to have three real roots and begins to have only one real root. The equation for this "criterion-curve" is $G^2 + 4 H^3 = 0$; where

$$G = \sqrt{\chi}\left(2\lambda - 3\lambda^2 - \frac{16}{22}\chi\right), \; H = \lambda\,(1 + 3\lambda) - \frac{4}{9}\chi.$$

Expanding, and observing that the terms involving χ^3 and $\chi^2\lambda$ vanish, we obtain for the left side of the equation

$$\lambda^2 \left\{ \frac{32}{3}\chi^2 - \chi\left(\frac{16}{3}(1 + 3\lambda)^2 - (2 - 3\lambda)^2\right) + 4\lambda\,(1 + 3\lambda)^3 \right\}.$$

Since this expression vanishes when $\lambda = 0$, it might be hastily inferred that one passes from possible to impossible roots (of the cubic equation to which the criterion refers) in crossing the axis of χ.‡ But the circumstance that the factor in virtue of which the criterion vanishes when $\lambda = 0$ is a *square* negatives this natural interpretation. If we could imagine that—contrary to the axiom which asserts that there cannot be two right lines drawn between two points so as to enclose a space—there were two straight lines joining the origin to some other, say, an indefinitely distant point on the axis of χ, then, indeed, as we passed from the upper quadrant into the intervening space, the criterion would change its sign, and the cubic equation its character; and again there would be a change of sign and character as we crossed the lower line into the lower quadrant. This comes to saying that in fact there is no change as we cross the axis of χ. We may therefore abstract the factor λ^2, and take for the effective criterion-curve

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* For some further suggestions as to exceptional cases the reader is referred to our Congress Paper (Congress of Mathematicians at Cambridge, 1912), Section IV.

† *Ante*, p. 421.

‡ *Cp.* note to p. 421, *ante*.

$$\frac{32}{3}\chi^2 - \chi\left(\frac{16}{3}h^2 - g^2\right) + 4h^3\lambda = 0;$$

where $h = 1 + 3\lambda$, $g = (2 - 3\lambda)$; $(g + h = 3)$.

Thus for any assigned value of λ we have a quadratic equation for χ; with roots either both real, equal, or both impossible. The value of λ, at which the quadratic changes its character—the roots passing through equality from, or to impossibility—is determined by equating to zero the expression $\frac{32}{3}4h^3\lambda - \frac{1}{4}\left(\frac{16}{3}h^2 - g^2\right)^2$, the criterion of the criterion, as it may be called. Taking h as the independent variable (substituting for g and λ their values in terms of h), I obtain for h the biquadratic equation

$$343h^4 - 980h^3 + 972h - 729 = 0.$$

This equation resolves itself into factors, thus—

$$(7h - 9)^3\,(h + 1) = 0.$$

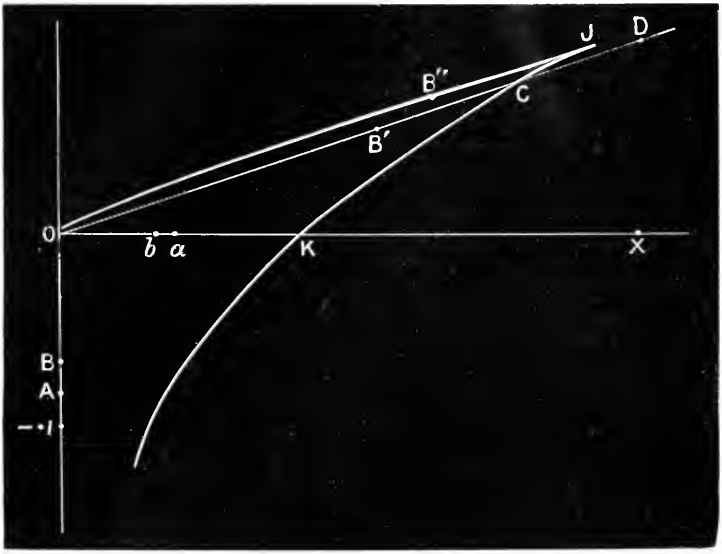
There are thus three equal roots, $h = \frac{9}{7}$, corresponding to $\lambda = \frac{3}{21}$.

There is also one negative root, $h = -1$, corresponding to $\lambda = -\frac{2}{3}$; which value being substituted in the quadratic equation for χ, all the coefficients of that equation become positive, and therefore both the values of χ are *negative*, and therefore do not concern us here.

The (double) value of χ, corresponding to $\lambda = \frac{2}{21}$, proves to be $\frac{1}{2}\,\frac{27}{49}$, or ·2755... Since at this point two branches of the criterion-curve unite, it may be expected that the cubic equation (which gives the points at which Y, the ordinate of the constructed curve, is stationary) corresponding to that pair of values for χ and λ will have three equal roots. And this proves to be the case, the triune value for ξ being $\sqrt{1{\cdot}5}$. At the said point $\left(\lambda = \frac{2}{21}, \chi = \frac{27}{98}\right)$ the criterion-curve has a *cusp*, as intended to be shown in Fig. 6, at the point J. Substituting different values for λ ·05, ·01, − ·1, − ·2, &c., I have roughly traced the curve. It will be observed that for negative values of λ, there is only one branch of the curve (with which we are concerned). The curve crosses the axes of λ at the point $\chi = \frac{1}{8}$ (K), and passes out of our view at the point (not shown in the figure) $\lambda = -\frac{1}{3}$, when h, and therefore the absolute term of the quadratic for χ, vanishes.

The criterion-curve forms a *second* division of the plane (χ, λ) on the positive side of the axis λ; the *first* division being formed by the limiting straight line $\chi = 3\lambda$. The first division separates the (pairs of) co-ordinates which do from those which do not cause the *denominator* of $\frac{dY}{dX}$, the tangent to the constructed curve, to vanish. The second

FIG. 6.



division separates the (pairs of) co-ordinates which do from those which do not cause the *numerator* of $\frac{dY}{dX}$ to vanish. Call the class of cases for which the *denominator* equated to zero has impossible roots "A"; and the rest of the "universe" under consideration "a." Likewise, call the class of cases for which the *numerator* equated to zero has impossible roots "B," and the rest of the universe "b." Then the universe will have been subdivided into four classes, which are represented in Fig. 6 as follows. AB = the whole of the area to the right of the axis λ, *outside* the *area* OB″JCKL (L, a point not shown in the figure, distant from O four times the distance of OA).

Ab = OB′CJB″.

ab = OB′CKL.

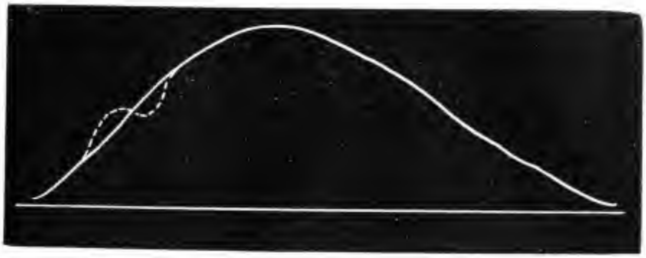
aB = the area to the right of the curve LKC, and the line CD produced to infinity.

Now let us consider the shapes of the constructed frequency-curves corresponding to these logical divisions. Fig. 7A represents by the thick curve-line the shape corresponding to the class AB, the shape most nearly resembling that of the normal error-curve, as having only one maximum or "mode," and sloping down on either side of the mode continuously on to infinity.

The same figure by the dotted curve-line illustrates the class Ab characterised by an additional maximum and a minimum.

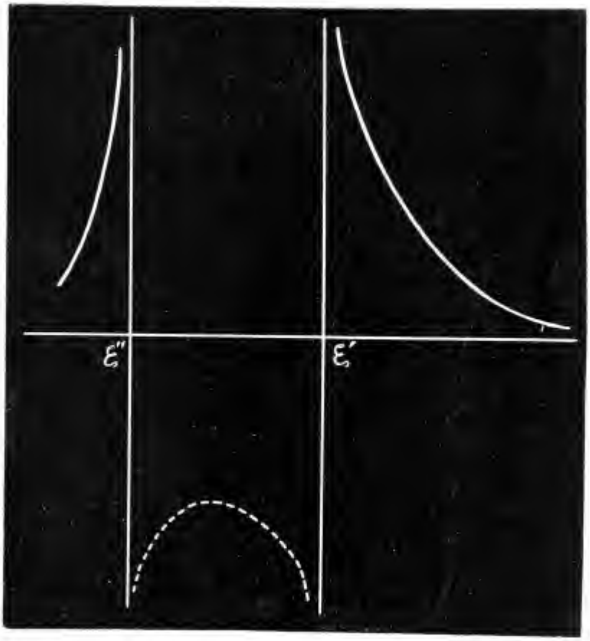
The class not-A, or "a," is characterised by the occurrence of two infinite ordinates, to omit the limiting and rare case of these

FIG. 7 A.



two being one.* These ordinates form the boundaries of a tract throughout which the ordinates of the constructed frequency-curve are *negative*. That is, the construction is insignificant, the attempted translation has broken down. There are two types of this failure, represented by Fig. 7, aI and Fig. 7, a2, respectively. In the latter

FIG. 7, aI.



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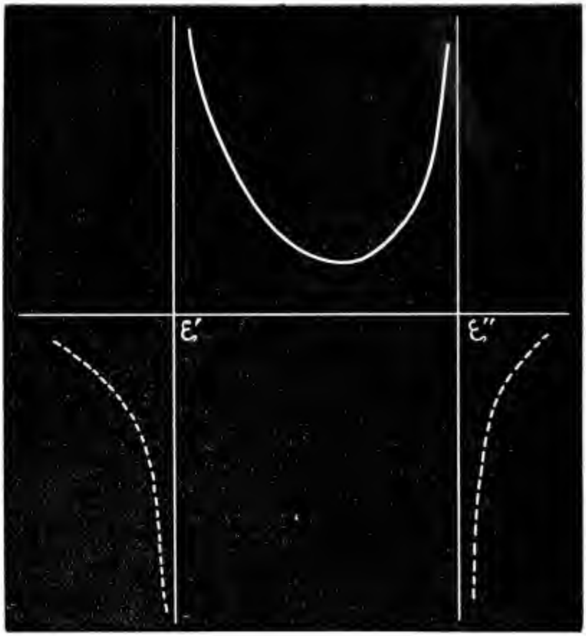
* The case of two coincident "breaks" is sufficiently illustrated by taking a point on the limiting line $\chi = 3\lambda$; for instance, the one specified above as presenting a very high value of ϵ, $\chi = 9$, $\lambda = 27$. At this point there will be two coincident infinite ordinates. In the immediate neighbourhood of the limit on the left the curve will have the regulation form.

FIG. 7 a 2.



case it will be observed that the insignificant tract lies at the extremities of the curve, and contrariwise in the former case. These figures as they stand represent only aB; but they may easily be converted so as to represent ab by *crumpling* any portion of the curve (whether significant or insignificant) in the manner shown by the dotted curve in Fig. 7A, so as to introduce a second maximum and minimum.

With respect to these two figures, and especially the first, Fig. 7, aI, it may be asked: Why should not the ordinate of the curve, after ascending to positive infinity and immediately descending to negative infinity at one of the breaks, say, ξ', thereafter pass to positive infinity at the other break, crossing the abscissa without passing through negative infinity. The answer is that the ordinate of the constructed curve—viz., $f\,(\xi)/a(1 \pm 2\kappa\xi + 3\lambda\xi^2)$, where f denotes the form of the normal error-curve and ξ an abscissa measured from the centre thereof—this ordinate can only become, or cease to be, negative by the vanishing of the denominator, which occurs only at the points of breakage, ξ' and ξ''. In this connection it may be remarked that the *median* of the constructed curve, corresponding to the centre of the originating normal curve cannot occur in the insignificant portion of the construction, since at the median $Y = f(\xi)/a$ (the constant a assumed to be essentially positive).

A distinction of more practical importance than the logical dichotomy which has been exhibited is the division of class not-A into two species according as the breakdown which forms the definition of the class does or does not occur within the sensible portion of the curve,* say species *a* and α. Likewise "b" is divided into *b* where the *crumpling* occurs at such a distance from the main portion of the area as to be practically unimportant, and β.

Geometrically, remembering that "not-A" (= "a") is demarcated by the line OCD (produced to infinity) in Figs. 3 and 4, we divide that area by the parabola AC drawn in Fig. 3, not reproduced in Fig. 6 (to avoid confusion), but supposed to be drawn from A through *a* to C in that figure. The demarcated area to the left of that curve is *a*; all the rest of the area (underneath the said line) being α. Likewise the parabola designated AB in Fig. 4 is supposed to be drawn in Fig. 6 from B in that figure through b and B′ on to B″ (coincident with the B of Fig. 4). This parabola divides the content of the criterion-curve into two regions, *a* on the left of the parabola characterised by the situation of the minimum at a distance from the median for the constructed curve corresponding to a distance greater than 2 (twice the modulus), from the median of the generating normal curve; B on the right of the parabola with the contrary character.

With these explanations the reader should have no difficulty in breaking up the fourfold classification which first presented itself into the species now introduced. It will be observed that formally the *two trichotomies* (A, *a*, α) (B, b, β) form *nine* combinations. Those species which are designated by Roman or English letters only (AB, *ab*, Ab) belong to the category of slightly or moderately abnormal, the cases suitable for treatment by our method. The unfavourable cases are designated by a combination of letters, of which one is Greek (αB, $\alpha\beta$, Aβ, *a*β). The boundary BbB′B″JCD∞ in Fig. 6 separates the more and less tractable species—the sheep, so to speak, from the goats; the goats in our arrangement being put on the *right*. The varieties of the sheep and of the goats are penned in the separate enclosures which have been indicated. It will be observed that for each herd one of the compartments distinguished by formal logic is empty; here *a*B, and there α*b*.

The slightly and moderately abnormal species belong to the preceding subsections, and are sufficiently illustrated by the examples there given. It is doubtless not accidental that the great majority of those examples, taken indiscriminately from the publications known to the writer, belong to the species most suitable for treatment by our method, namely AB. Thus all the instances in Table IV, a great majority in Tables I and III, and a majority in Table II belong to this good species. Species A*b* is illustrated by the penultimate example in Table I, for which λ is found to be ·0038; if we take for χ the first approximation (presumably in this case† practically identical with the second approximation) $\frac{4}{9}\beta = \cdot 0111$—since the point thus presented is on the *left* of the limiting line $\chi = 3\lambda$, while on the right of the criterion-curve. If χ is found to be greater than $3 \times {\cdot}0038$ (·0114) the case belongs to the species *ab*. Other examples of that species are afforded by the cases in Table I for which λ is *negative*; the corresponding points on the plane (χ, λ) being well within the parabola which separates b on the left from β on the right.

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* See *ante*, p. 310, *et passim.*

† See *ante*, p. 312, par. 1.

I shall dwell more fully on examples illustrating very abnormal frequency-curves, the subject of the present subsection. First, it may be well to put on record the numerical values which I have assigned to the symbols Q, R, S, T which occur in the following and many of the preceding calculations. The values of these functions of λ calculated by me for several "round" values of λ are shown in Table V. I am prepared to find that here and elsewhere, in the course of the laborious and delicate calculations which I have undertaken unassisted, serious arithmetical errors have occurred. But as they will have occurred fortuitously and without any conscious bias, so I trust that they may not prove fatal to the object with which the calculations have been undertaken: to illustrate a method based on the theory of Probabilities and recommend it to the use of practical and less unerring statisticians.

TABLE V.—*Showing the values of certain dependent variables for assigned values of the independent variable* λ.

λ.	Q.	R.	S.	T.
+ ·2	3·975	1·75	3·7	·911
+ ·05	1·9921875	1·159375	1·50625	·077
+ ·025	1·73555	1·07734	1·239	·03117
0	1·5	1	1	0
− ·025	1·28555	·927343	·789	− ·03017
− ·05	1·0921875	·859375	·60625	− ·0314
− ·1	·76875	·7375	·325	− ·0387
− ·15	·5296875	·634375	·15625	− ·0358
− ·2	·375	·55	·1	− ·029

The results recorded in Table V form data for the calculations required in the construction of Table VI. In this table the first column gives a number for convenience of reference. The second column specifies the attributes defining the class of each example according to the principles of division above explained. The third and fourth columns state the given values of the constants β and ϵ. The fifth column contains values assigned to λ, round numbers believed to be the nearest of the round numbers employed in Table V to the true value of λ, but often, it is to be feared, not very near. The sixth column contains the corresponding values of χ calculated from the given β and the assumed λ by means of the fundamental equation I. The seventh column gives the abscissas of the "breaks" or points at which the ordinate of the constructed curve becomes infinite: the points designated ξ', ξ'' on a former page, points which only occur when the example belongs to the class α or *a*. The eighth column gives the minimum (if any) at which the constructed curve may be held to *stop*. The ninth column gives the principal maximum, the one which it is proper to take as the "mode." Such a maximum does not always exist; but where it does exist it can be always practically, and I think even theoretically, distinguished from the second maximum, which is of comparatively slight significance. In the last column the source from which the example was taken is described. I have adduced concrete examples as far as possible; but the insufficiency of my knowledge has compelled me to employ fictitious examples for the illustration of certain species.

TABLE VI.—*Illustrating very abnormal frequency-curves.*

No.	Class.	β	ϵ	λ	χ	Breaks.	Stop.	Mode.	Third critical point.	Source.
1	A β	....	....	·08	·2304	....	1·5	·705	1·79	Fictitious.
2	*a* β	·05	·012	−·025	·0256	2·1 − 6·36	1·8	·18	−6·28	Fictitious.
3	*a* β	·006	·021	−·025	·0334	1·95 − 6·82	1·67	·21	−6·7	Pearson (size of families), *Chances of death*.
4	**a** B	....	....	·025	·25	1·09 −12·24	−12·21	...	....	Fictitious.
5	**a** B	·13	·105 (·103)	−·025	·07	1·5 − 8·6	− 7·4	....	....	Greenwood, *Biometrika*, vol. vi, p. 508 (two examples).
6	**a** B	·4	·265 (·3)	−·1	·397	·68 − 4·88	− 4·77	....	....	Elderton, *Frequency curves*, p. 103 (fictitiously modified).

Much of what remains to say about the application of our method to very abnormal curves may be expressed in the form of comments on the several examples contained in Table VI.

No. 1 is a fictitious example, intended to illustrate class Aβ. It is accordingly arranged that the χ and λ should denote a point falling within the little area B′B″JC. The λ adopted for this purpose not being one of the round numbers employed in Table V, I could not without much trouble calculate β and ϵ. Their *whereabouts* may easily be found. There are, by hypothesis, no breaks in this case. There is a maximum at the point corresponding to the point on the generating normal-curve (with unit modulus) which is distant ·705 from the centre to the *left*; that direction being taken as *positive* in the present context.* There is a minimum at the point 1·5 (as we may say for the sake of brevity after the explanation just given). The curve may be considered as stopping here; the remaining "tail" some 17 per mille of the total being unrepresented. The subsequent proceeding to a maximum, the "third critical point," at 1·79 does not interest us.

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* *Cp. ante*, p. 417.

No. 2 is also a fictitious example arranged to illustrate the species $\alpha\beta$ for which the point represented by $\chi\lambda$ falls within the area ABba. Consistently with this character there are *breaks ;* but both at a distance greater than 2 from the origin. Consistently with the attribute β, there is a minimum or stop at a distance less than 2 to the left at the origin. The other minimum occurs on the right side, near the *break* on that side. The minimum on the left cuts off less than $1\frac{1}{2}$ per mille of the group. The loss due to the minimum on the right is insensible.

No. 3, taken from Professor Pearson's *Chances of Death*, exemplifies the failure of both conditions in a mild degree. The minimum at 1·67 implies that some 9 per mille of the group is unrepresented. The other minimum at the distance 6·7 is not effective.

No. 4 is constructed as an example of αB, with positive value of λ. There is by definition only one critical value, the "stop" at the immense distance 12·21 on the right. The break on the left cuts off some 17 per mille of the group.

No. 5 stands for two concrete examples given by Dr. Greenwood, for which the ϵ constants are respectively ·103 and ·105. There is a break at 1·5 to the left. From the height of positive infinity, the ordinate descends continuously as we move from the position of the break to the right on to the immense distance 7·4, when the curve (which has long ceased to be of practical significance), turns up and trends towards positive infinity, which is reached at a distance 8·6 from the centre. There is no mode or other maximum ; the curve trends continuously downwards from an infinite height.

No. 6 is adapted from an example given by Dr. Greenwood so as to illustrate a rather bad case of αB. The given β-coefficient is fitted well enough ; but the ϵ-coefficient (shown in brackets) employed is somewhat larger than the given one. It appears that about 16 per cent. of the group is cut off by the break.

It may be asked why we have not employed the concrete data without modification. The difficulty, not to say impossibility, of fitting a translated curve to the data forms the answer. This answer may seem inconsistent with the rule above given for locating the point in the plane of $\chi\lambda$ corresponding to a given value of β and ϵ. We were to get on to the beta-curve having the given value of β, and if the value of ϵ at the point where we got on was *greater* than the given value of ϵ, we were to *descend* along the beta-curve until, cutting through eta-curves with ever smaller and smaller values of ϵ, we should reach one which presented the given value.* But this rule holds good only to a certain distance below the axis of χ. It is applicable within and far beyond the limits of safe practice ; to "moderately abnormal" frequency-groups, and even the less immoderate of those here called "very abnormal." But there is a limit at which the rule breaks down.

The limit is easily discerned in the simple case of a beta-curve indefinitely close to the axis of λ, represented by the dotted line in Fig. 8. This curve is almost perpendicular to the axis of χ at the point where it cuts that axis; and the eta-curve at that point cuts the axis at an angle of which the tangent ($d\lambda/d\chi$) is very nearly -2. As we descend the beta-curve from that point, the successive eta-curves, at first sticking out like bristles at an angle of some $26\frac{1}{2}$ degrees from the beta-curve, become gradually brushed down, as it were, until at length they lie smoothly on the beta-curve. This consummation occurs at a distance below the origin of very nearly $-\cdot 2$. Beyond that point, if we continue to descend the beta-curve, the eta-curve will begin to cut it in a different fashion; the upper part of the cutting eta-curve being now to the *right*—not, as before, to the *left*—of the cut beta-curve. In short, if we descend beyond the said limit, we shall cut through eta-curves of which each succeeding one is *exterior* to the one before, with ever *larger and larger* constants. A similar theory holds good for any other beta-curve. The limit is defined as the locus of a point such that the tangent to the beta-curve passing through the point is coincident with the tangent to the eta-curve passing through the point. This is a locus of a kind which is commoner, I think, in mathematical economics than in ordinary mathematical physics. The celebrated "demand-curve" may be regarded as belonging to this class.* The less familiar "contract-curve"† is even more obviously of the same class. Analogously to the contract-curve the equation of the locus now under consideration may be written—

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* *Ante*, p. 427.

$$\left(\frac{d\,\Phi}{d\,\chi}\right)\Big/\left(\frac{d\,\Phi}{d\,\lambda}\right) = \left(\frac{d\Psi}{d\,\chi}\right)\Big/\left(\frac{d\Psi}{d\,\lambda}\right);$$

Where Φ and Ψ are the functions of λ respectively equated to β and to ϵ by the fundamental equation I and II ‡ explicitly, we have—

$$\frac{\left(\frac{d\Phi}{d\chi}\right)}{\left(\frac{d\Phi}{d\lambda}\right)} = \frac{\chi^2(3R - 2Q) + \chi(4QR - 2Q^2) + Q^2R}{\chi^3(2Q' - 3R') + \chi^2(2Q'(Q + R) - 6R'Q) + \chi Q(2Q'R - 3QR')},$$

$$\frac{\left(\frac{d\Psi}{d\chi}\right)}{\left(\frac{d\Psi}{d\lambda}\right)} = \frac{2\chi(R - S) + 2(RS - T)}{2\chi^2(S' - R') + \chi(2RS' - 4R'S + T') + RT' - 2R'T};$$

where Q′, R′, S′, T′ denote the differential coefficients with respect to λ of these several functions of λ. Multiplying out we have for the required locus a curve of the form

$$a\chi^4 + b\chi^3 + c\chi^2 + d\chi + e = 0;$$

where a, b . . . e are functions of λ.

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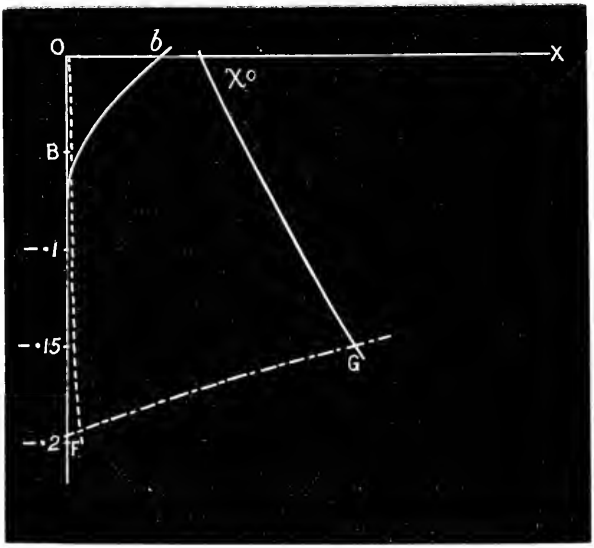
* See *Mathematical Psychics*, appendix v. The reviewer of Jevons' Theory, who is there criticised, though conversant with ordinary Differential Equations, was baffled by this peculiar kind of equation.

† Formulated by the present writer in his *Mathematical Psychics*, and employed by Professor Pigou in his *Industrial Peace*.

‡ *Ante*, p. 307.

I have taken the great trouble of determining the values of the coefficients for two or three assigned values of λ, and solving the resulting biquadratic equation for χ. I find in each case only one suitable value for χ; as thus, when $\lambda = -1{\cdot}5$, $\chi = {\cdot}15$ nearly; when $\lambda = -{\cdot}1$, $\chi =$ about ${\cdot}95$. The curve, of which the trend is roughly indicated by the broken line FG in Fig. 8, extends from

FIG. 8.



a point on the axis of λ distant not quite ${\cdot}2$ from the origin to a point on the axis of χ infinitely distant from the origin. The absolute term of the biquadratic, $e = Q^2R(RT' - 2R'T)$, becomes zero when $\lambda = -1{\cdot}99$ . . . The coefficient of λ^4, a, becomes zero when $\lambda = 0$. We may describe this limitary curve, using one of the technical terms which Professor Pearson has found it necessary to coin, as the *locus of minimum "kurtosis."*

I do not affect great accuracy in tracing a locus which has but scant relation to practical statistics. The limit, which has been roughly indicated is seen to be far removed from the limit B*b*B' (in Fig. 8, as in Fig. 6) within which the species suitable for our use, the sheep of our metaphor, have been penned. Only the goats, and, as far as my experience goes, only a very small percentage of them approach and are restricted by the outer hedge FG. On the negative as well as the positive side* the concrete instances for which positive roots χ are not obtainable from the fundamental equations are rare. On the negative as well as the positive side it is theoretically interesting to show that such instances may conceivably exist. But the theoretical possibility of exceptions is not so unlimited, as will presently appear, at the negative as proved to be the case at the positive *hinterland.*

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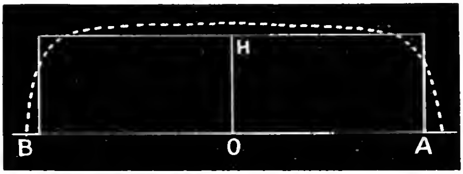
* Above, p. 655.

The theory of outlying instances in the lower quadrant (of the plan χ, λ) may be introduced by the simple case of symmetry, where $\chi = 0$. Starting from the normal error-curve, let us endeavour, by continual variations of shape, to reach a shape for which the "kurtosis" is a minimum consistent with the condition that the curve should be unimodal. Continually flattening the vertex we shall reach a limiting form in a curve-line which is in the immediate neighbourhood of and just passing into a rectangle, as shown in Fig. 9A. Now let us find the value of η, the measure of the kurtosis,

FIG. 9 A.



for a rectangle. Put OA the half-base $= \text{OB} = x'$. Let the perpendicular height $\text{OH} = \text{A}\frac{1}{2x'}$, where A is the total area. Then μ_2 the mean square of deviation is $2\text{A}\frac{1}{2x'}\,\frac{1}{3}x'^3 \Big/ \text{A} = \frac{1}{3}x'^2$. Likewise μ_4, the mean fourth power of deviation, is $\frac{1}{5}x'^4$. Therefore,

$$\beta_2 = \mu_4 \Big/ \mu_2^2 = \frac{9}{5}; \ \eta = \beta_2 - 3 = -1{\cdot}2 \ ; \ \epsilon = \frac{1}{12}\eta = -{\cdot}1.$$

Now comes the interesting question: Can we translate a normal curve so as to present this minimum degree of *kurtosis?* Since by hypothesis the required value of χ is zero, the first fundamental equation drops out, and the second reduces to $\text{T} = -{\cdot}1\text{R}^2$. On substituting for T and R their values in terms of λ,[*] there results a biquadratic equation for λ *without any possible root.* At the same time, as may be seen by forming the "derivative" equation (for the biquadratic), a possible root is missed by a very little. In fact, if we investigate the condition that $-\text{T}/\text{R}^2$ should be a maximum in absolute quantity, we shall find that the maximum is *very nearly* ·1; the corresponding value of λ being that which we have already found for the point at which the *locus of minimum kurtosis* starts from the axis of λ.[†]

The generalisation of this theory appears to be as follows:—Let 0 be the centre of gravity of an unsymmetrical unimodal shape which is just passing into the form of two rectangles, like those in Fig. 9B. Let $0A = x_1$, $0B = x_2$, $0H_1 = y_1$, $0H_2 = y_2$. Then, as

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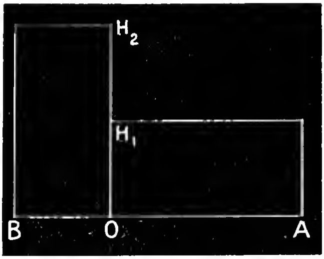
[*] *Ante*, p. 307.

[†] The identity is explained by the circumstance that $\frac{d}{d\lambda}\text{T}/\text{R}^2$ is a factor of C, the absolute term of the curve of minimum kurtosis.

FIG. 9 B.



the area may be taken without loss of generality to be equal to unity, we have—

$$y_1x_1 + y_2x_2 = 1$$
$$y_1x_1^2 - y_2x_2^2 = 0.$$

Whence
$$y_1 = \frac{x_2}{x_1(x_1 + x_2)}$$
$$y_2 = \frac{x_1}{x_2(x_1 + x_2)}.$$

We have then $$\mu_2 = y_1\frac{1}{3}x_1^3 + y_2\frac{1}{3}x_2^3 = \frac{1}{3}x_1x_2.$$

Again $$\mu_3 = \frac{1}{4}x_1^4y_1 - \frac{1}{4}x_2^4y_2 = \frac{1}{4}x_1x_2(x_1 - x_2).$$

Accordingly $\beta_1 = \mu_3^2 / \mu_2^3 = \frac{1}{16}(x_1 - x_2)^2 \big/ \frac{1}{27}x_1.x_2$. Now let $\left(\frac{x_1}{x_2} = \rho = \frac{1 + \alpha}{1 - \alpha}\right)$, $x_1 = \frac{1}{2}c\,(1 + \alpha)$, $x_2 = \frac{1}{2}c\,(1 - \alpha)$. Then

$$(1)\ \beta_1 = \frac{27}{16}\,\frac{4\alpha^2}{1 - \alpha^2}.$$

Likewise $$\beta_2 = \frac{9}{5}\,\frac{1 + 3\alpha^2}{1 - \alpha^2}.$$

Thus $$(2)\ \eta = \beta_2 - 3 = \frac{42\alpha^2 - 6}{5(1 - \alpha^2)}.$$

Eliminating α between (1) and (2) we have

$$\eta = -1{\cdot}2 + \frac{16}{15}\beta_1$$
$$\epsilon\left(= \frac{1}{12}\eta\right) = -{\cdot}1 + \frac{32}{45}\beta\ (\beta = \tfrac{1}{8}\beta_1).$$

Thus in general, consistently with unimodality, ϵ may conceivably be not indeed as small as in the particular case of symmetry, but larger than the minimum value proper to that case by the addition of only $\frac{32}{45}\beta$.

The question now arises, when the given frequency-group is of this peculiar kind, is it possible to represent it by a translated error-curve, with constants determined by the two main equations? The answer appears to be in the negative. I have taken two or three points on the locus of minimum kurtosis, and formed the corresponding values of β and ϵ from those of χ and λ. In every case I find that the ϵ is not so small as it might conceivably be according to the formula $\epsilon = -\cdot 1 + \frac{32}{45}\beta$. But the observed ϵ is the minimum attainable for any assigned β. As we descend any β-curve we approach the ideal minimum of ϵ, until we have reached the locus of minimum kurtosis. At that limit it is realised that the ideal is not to be attained in the plain of $\chi\lambda$. It is, as it were, in the air in another dimension.

No doubt the distance of the ideal relation from the plane of $\chi\lambda$ in the region of impossibility seems in general to be inconsiderable, as we found in the particular case of a symmetrical frequency-group.* Still there is an undeniable failure. There is not merely a "break" due to an infinite ordinate causing, as we have seen with reference to examples in Table VI, a part of the construction to be insignificant; but there is a *breakdown* fatal to the whole construction. The failure is as complete as that which was noted with respect to the extreme regions of the upper quadrant.†

While fully admitting these failures I do not regard them as very serious considering the extreme rarity of the specimens which thus fail to correspond to our type. The less complete failures are probably more serious, being less extremely infrequent. Such are the last two or three instances in Table VI, where only a part of the construction is insignificant, only a part of the data is unrepresented. This class of exceptions constitutes a formidably recalcitrant minority—the Ulster of our newly constituted system.

Before pronouncing the fateful word "exclusion," it behoves us to consider whether some compromise allowing partial inclusion may not be adopted. In favour of inclusion may be urged the affinity between cases which must unquestionably be retained and those of which the retention is in question. Thus, consider the penultimate example in Table I, taking $\lambda = \cdot 004$. If, as probably, χ is *less* than $\cdot 012$ ($= 3\lambda$), the group belongs to class "A"; there is no "break," no discontinuity caused by an infinite ordinate. But if χ is *greater* than $\cdot 012$, say $= 0121$, there is a break; yet it is at such a distance from the main body of the group—more than *eight* times the modulus of the generating normal curve—as to be insensible. There is no practical difference between the two cases supposed. It is likewise indifferent whether or not the curve be *crumpled* when that feature occurs at a great distance from the median. In the case supposed there is a *minimum*, or "stop," at a distance of some *eight* moduli, cutting off an infinitesimal portion of the group. But there is no material difference between the given case and one which would be presented if we supposed the given λ to be a little greater, the given χ a little smaller, so as to bring the point outside the "criterion-curve" (which in the neighbourhood of the origin lies just outside the limiting line $\chi = 3\lambda$). In fact, the instance as it stands might well be quoted as an illustration of the perfectly normal error-curve.

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* Above, p. 667.

† Above, p. 656.

Well, there is no distinction in kind between the distant break and stop which we have been considering and those which occur at a less distance; as in the third example of Table VI. There the stop occurs at a distance of 1·67 modulus (from the centre of the generating curve). Accordingly nearly 1 per cent. of the given group is unrepresented. But is not the remaining 99 per cent. as well represented as the whole was in the previous example? Where are we to draw the line? Or, rather, may we not draw it at the *minimum*, the second stationary point which puts a stop to further translation? That is, when there is such a point. But next, supposing that varying the data so as to become more and more abnormal, we move the point (χ, λ) to the right so as to cross the criterion-curve. At that limit the *crumpling* of the constructed curve disappears. Say that the transition occurs at the point $\chi = \frac{1}{8}$, $\lambda = 0$. Just before crossing the criterion-curve there was an inconspicuous minimum, a mere dip or dimple, in the neighbourhood of the percentile which is at a distance of ·707 from the centre of the generating curve. When the dimple just disappears, the constructed curve descending continuously from the position of the infinite ordinate, the portion of the constructed curve which was before translated does not now cease to be translated. That is some 84 per cent. of the area—to the right of the percentile corresponding to ·707 modulus. The only difference is that we have now no exact limit for the percentile, on the left of which the translation is insignificant. Presumably the untranslatable portion becomes greater when the *break* comes nearer the median; for instance, greater in the last example of Table VI, when the break is at the distance of ·68 (modulus) than in the case just now considered. Now, if the best arrangement of the phenomena is according to the degrees of a leading attribute, and that attribute is affinity to the normal error-curve, a method of representation which emphasises the deficiency of that attribute may well be the ideal method. That may be the method proper to biological science and natural philosophy. The actuary may, indeed, desiderate with respect to the insignificant part of the construction, the use of an analytical formula by which the frequency may be graduated. But perhaps the given frequency-group may be so abrupt as not to lend itself to this kind of graduation. Perhaps a separate kind of graduation—say by way of a parabola—might be applied to the untranslated parts of the curve.

A case for exclusion would be made out if not only the untranslateable part, but the whole of the given group was particularly related to the business of the actuary, and specially adapted to the actuarial formulæ due to Gompertz and Makeham. Probably it is not accidental that many of the examples which prove most recalcitrant against translation—such as some of those given by Mr. Palin Elderton in his *Frequency Curves*—pertain to vital statistics. Of course, where a *law* in the ordinary scientific sense makes its appearance, the law of chance is dispensed with.

Another plan of excluding the recalcitrant minority would be to represent these exceptional cases by one or other of the Pearsonian types while applying the method of translation to the great majority of cases. The want of unity may of course be objected to this dual system. Yet it may be doubted whether it would be at a great disadvantage in this respect as compared with the prevailing system due to Professor Pearson. It is true that all his Types spring from one root, the differential equation with constants appropriate to different cases. But that root is, so to speak, deep underground; above ground, and for practical purposes, the stems diverge in such wise that there is difficulty in passing from one to another.* The plan now proposed might afford a more convenient and perspicuous arrangement for the great bulk of the phenomena; though with regard to the exceptional cases the character of unity in plurality would be foregone.

But even if the method of translation is at a disadvantage in respect of unity, that disadvantage is not decisive, until there has been set against it the advantage which the method possesses in being able to deal with a truncated frequency-group, a statistical torso, by way of percentiles; the subject to which we proceed in the Second Section.

(*To be continued.*)

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* *Cp. Congress Paper*, sect. vi; p. **440**, vol. ii, of the Proceedings of the Congress.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Census of India*, 1911; Vol. i. *Report.* By E. A. Gait, C.S.I., C.I.E., F.S.S. Fol. Calcutta, 1913. Price 7*s.* 6*d.*

The compilation of the results of the fourth census of India was carried out with such unexampled rapidity that all the returns except those of caste and occupation were ready within a few months of the enumeration, and several of the more important have been already reviewed in the *Journal*. The preparation of the Report was delayed by the promotion of the author to the responsible duties of a member of the Executive Council of the newly formed Province of Bihar and Orissa, which were superimposed upon those of Census Commissioner. However much these additional calls upon his time may have prolonged the period of gestation, they have in no way diminished the value of the result or the attractiveness of the way in which Mr. Gait has dealt with the difficult and important problems to be found in the numerical aspect of Indian society. We have it, indeed, upon the author's word, that he found himself unable to discuss certain topics as fully as he had intended, but a reviewer may confidently assert that this shortcoming will not be debited against him, except, perhaps, by the parents of hypotheses upon highly controversial and unprovable questions, whose views Mr. Gait has genially sprayed with statistical shrapnel.

The circumstances of India, from an administrative standpoint, make it necessary for the census report to be extended considerably beyond the limits which would suffice in the case of a more homogeneous country and population. The figures have to be set forth in the main, of course, by political and administrative Divisions, that is, by States, Provinces or Districts. This demarcation, however, dependent as it is upon historical and other artificial considerations, is, in most cases, overridden by the distribution of language, religion, social grouping, and, above all, in a country pre-eminently agricultural, by physical conditions. In regard to this last, the factor of most wide-spread importance is the rainfall. In the report, accordingly, the density and movement of the population are considered. in relation to this, and the whole country is shown under sixteen "Natural Divisions," irrespective of political or administrative distinctions. This grouping proves that density of population does not always vary with the amount of the annual rainfall, though a line may be drawn at 40 inches, above and below which there is a general correspondence between the two. But even here other factors have to be taken into account, such as the conformation of the surface, the nature of the soil, and the relative facilities for supplementing by irrigation a scanty rainfall. Political considerations also enter into the case, where the population has been kept far below the natural capacity of the tract by the maladministration which preceded British rule. The only general conclusion, then, which can be reached safely is that in the most densely-peopled parts of India the predominant crop is rice, and even this is not true as regards Lower Burma, the most rice-growing of all. As to the rate of increase of population, the tendency seems to be for it to vary inversely with the actual density. Taking the mean figure of the latter to be 175 per square mile, half the net increase in the ten years took place in sub-divisions which had less than 150 per mile in 1901, and very little of it in those which had over 450. The mean rate of increase, which is given as 6·4 per cent., was much exceeded in the Provinces most affected by famine shortly before the last census and in the two Divisions of Burma, but it was diminished in some of the more densely peopled tracts of Upper India by plague and severe outbreaks of malarial fever. On the whole, it corresponds fairly with the rate of natural increase ascertained actuarially from the results of the four enumerations, the question of migration to and from foreign territory being altogether unimportant in connection with this subject. Even this comparatively moderate rate of growth is maintained, it may be observed in passing, only through a lamentable waste of life, as a very high birth-rate is considerably neutralised by the high mortality.

One of the best-known features of the Indian population returns is the relatively small proportion of the urban element. The criterion of "Urbanity"—to follow the nomenclature used by Dr. Bowley in his recent paper before the Society—is in India a double one, involving both the form of administration and a minimum population, and this is justified by Mr. Gait against the adverse criticism of a distinguished German statistician. The minimum population standard must vary according to the circumstances of each country, and the 5,000 selected in India is not necessarily inconsistent with the 2,000 of a differently organised community. In a country like India, again, where municipal government is of comparatively modern introduction, it may be reasonably assumed that this privilege is not accorded to a place unless urban characteristics be present. As to the growth of the urban population in India, it appears that, in the aggregate, the rate of increase was lower than that of the rural; but this is due to the severity of the plague in some of the larger cities of the north and west. In detail, the usual course is for the most part manifest, and the capitals and middle-sized towns increased faster than the country round them.

One of the most vexed questions connected with the Indian census is the relative paucity of females, of whom there are returned only 954 per 1,000 males. Mr. Gait claims that the returns of 1911 corroborate his contention of 1901, that this disparity really exists, and is not due to the omission of this sex from the schedule. He enters into the matter at considerable length, and takes the preliminary and useful step of eliminating the effects of migration, which, though insignificant as regards the aggregate of India, are by no means negligible when dealing with the administrative units individually. He then proceeds to analyse the statistics, showing that there is nothing in the figures suggesting omission in one Province which are not contradicted by those for another part of the country. On the other hand, he points to infanticide, or, at least deliberate neglect of young girls, with the subsequent effects of premature marriage, clumsy midwifery, harsh domestic customs and the imposition of hard work, as amply sufficient to account for, or render very probable, a smaller number of females than of males. He adduces also further evidence of the now generally accepted fact that women succumb to the stress of famine less than the other sex. In the tracts which suffered most in 1899 and 1900 the proportion of the females rose markedly at the census of 1901, and receded in the course of the succeeding decennium, during which these tracts enjoyed, for the most part, a period of prosperity. On the other hand, it is now proved that in the case of plague and severe outbreaks of malarial fever, the mortality amongst women is greater than amongst men.

It has just been remarked that the marriage customs of India have a bearing upon the proportion of the sexes at certain ages. Mr. Gait has done well, therefore, to devote considerable space to the description of the various phases of this question, including the religious and social notions upon which the customs are based. This is one of the instances to which reference was made in the early part of this review, where matter apparently irrelevant to statistics has to be introduced in order that the conditions which the statistics illustrate may be fully understood. The whole field of custom as to marriage is here set forth, and no more succinct and comprehensive view has ever been published. Mr. Gait's successors, therefore, have here a standard authority from which to quote when handling their figures on the subject. Statistically, too, this part of the report explains the extraordinary variety in the relative numbers of husbands and wives, of bachelors, and of the widowed, and so on, in the different parts of India and amongst different communities.

In the same light may be regarded the elaborate account of the Caste system herein given. In this case, however, the question of origins is perhaps too obscure and certainly too controversial, to admit hope of finality respecting it. The Tables of Castes are of great interest to ethnologists, and when dealt with in combination with the statistics of marriage, literacy and occupation, acquire an administrative value which it is hard to over-estimate. The same may be said of the statistics of Parent tongue, of which full use was made in 1901 by Sir George Grierson, for his *Linguistic Survey of India*. Mr. Gait now supplements this with information obtained since the publication of his last report, and incidentally brings up to date some of the questions then left to conjecture. The subject, however, is one with which philology and ethnology are concerned rather than statistics, though the fact that the vernaculars of India number 220 indicates that their local distribution is not without its significance in the organisation of elementary instruction and other administrative functions.

The census of occupations presents in India difficulties similar to those found in more industrial communities, though in a simpler form. The return of 1911 shows great improvement over its predecessors, both in classification, which is now upon the Bertillon system, and in the record of the occupations exercised concurrently with agriculture by the same individual, information of special value in India. It also distinguishes the workers from the dependants under each head, and a beginning is made with the enumeration of industries by the issue of a special employers' schedule separate from the general return, which deals with occupations only.

The object of this review is to direct attention to the leading features of this work, the subject of which is the largest aggregate of population, not only of the British Empire, but of the yet enumerated world. No attempt has been made to criticise the views of the author upon any particular question treated in it. As to some of these there is room, no doubt, for difference of opinion, but disagreement would not be expressed by anyone except with considerable diffidence. No one has more experience of Indian census work than the author. He is widely read, as the report shows, in the standard literature of statistical demography, and has made a special study of the ethnic and social differences which complicate demographical questions in the country in which he has spent many profitable years. He may be safely recommended, therefore, as a trustworthy guide on the matters he has made exceptionally interesting in this volume. J.A.B.

2.—*Social Reform as related to realities and delusions—an examination of the increase and distribution of wealth from* 1801 *to* 1910. By W. H. Mallock. xii + 391 pp., 8vo. London: John Murray, 1914. Price 6*s*. net.

Mr. Mallock has returned once again to his favourite task of demolishing the wicked socialist and radical agitators, and of performing prodigies of valour with official statistics. Even if we cannot go all the way with him in his proofs of the poverty of the rich, and the riches of the poor, both increasing till they must surely meet, we shall not find it difficult to concede that many reformers exaggerate the importance of land rent, unearned increment, investment interest, the ratio of profit to wages, the stationary position of labour, or that they have erroneous views on social questions. Most of Mr. Mallock's "proofs" are doubtless adequate, in a rough sort of way. But as a serious contribution to statistical investigation his work still leaves much to be desired —the bias of the political proof in view is too often successful in its contest with the scientific spirit.

Mr. Mallock is mainly concerned in this volume with the statistics of Income Tax and House Duty—a field in which in the past his technique has been particularly faulty. Since, however, he has learnt to refer direct to the Inland Revenue reports, and knows some of the elementary pitfalls of his subject through sheer experience (at the expense of his reading public) his work has improved, and this book is undoubtedly an advance upon earlier work. But it is a little amusing to find him righteously accusing others of misconstruing official figures! He makes much of his discovery at Cambridge of "lost" statistics of Pitt's Income Tax of 1801 which are used by him "for the first time," and taken as a basis for comparison with the present. This "discovery" is somewhat on a par with his discovery in 1910 of "exceptionally searching statistics" in Mr. William's *The King's Revenue* (which was for the most part a copy of annual official reports). These 1801 figures were used quite recently in this *Journal* (p. 200). Issued as a report in 1801, they were reprinted in 1803; they were included in Marshall's Digest (1833) of which 1250 copies were printed for Parliament alone, and to which many references are made in statistical literature. They were also repeated in the volumes of the much discussed report of the Income Tax Committee of 1852. But on no occasion ought they to be used (for comparative purposes) without the strong warning that as the reconstituted system following immediately upon Pitt's scheme almost doubled the yield, these figures must have been far below the real facts. This important point is hardly hinted at by Mr. Mallock.

One or two examples of the way in which a piece of promising analysis is ruined, by over-eagerness to prove more than his point, must suffice. Mr. Mallock often fails to realise that he is not treating with first-hand social statistics but with statistics of assessments statutorily conventionalised, in which definitions, &c., were not framed for the convenience of reformers but for tax-yield and workability. Hence some technical knowledge of his material is necessary if he is to make his elaborate computations with success. Thus after squeezing out the water from "gross income reviewed" in various ways, to get the true income of the taxpayers, he discovers that whereas the Income Tax Commissioners allow a total "in respect of all kinds of upkeep" of 67,000,000*l*., the Census of Production has a total of 167,000,000*l*. He thereupon concludes, without any parley or inquiry, that the tax deductions are deficient by 100,000,000*l.*, and deducts the whole amount from his total as reduced. If the grotesque improbability had not struck him a little thought would have reminded him that the scope of the Census is much wider than the Income Tax, and an elementary text book would have shown that the "wear and tear" represents only a portion of the sums allowed, and that general upkeep and renewals are charged as expenses before the assessments are computed. Reference to the Tax Report for the year in which the "wear and "tear" Act came into force (1878) is very informing on this point.

Less important in actual amount, but much more serious than a blunder in its reflection upon Mr. Mallock's *bona fides* is his wilful inclusion in the amount "to be thrown overboard" (as not being real income) of what is described throughout the reports as "Life "Insurance Premiums," but which he includes in the terms "upkeep "and insurances."

In combating the Marxian fallacy, Mr. Mallock deducts from the income of the rich all profits from abroad, because it cannot enter into the comparison with home Labour income, if we are to have a proper view of the division of the products of home industry. On a point of principle, why not deduct from the aggregate labour income all the labour incomes made by labour in the service of labour (without the intervention of the capitalist) and also all the wages paid for personal services to the rich? His figures are not final as against Marx until they are confined, on *both sides*, to the area of *competition* in material production.

In attacking the Georgian position, he says "In 1862 the gross "rent of lands and houses was 114,000,000*l.*—in 1906 it was "222,000,000*l.*" an increase of 95 per cent." The figures are those for Schedule A as a whole, the content of which was radically changed in the interval—for the 1862 figures include railways, gasworks, waterworks, &c.! This fact is obvious in any table in which both years are given, or even if the items were extracted from separate reports. Again, Mr. Mallock is still ignorant of the effect of a quinquennial revaluation, for he continues to draw quaint inferences from the 1903 Schedule A figures.

Following upon his obvious desire to minimise the dividend and maximise the divisor, *i.e.*, the number of income taxpayers, in order to exhibit the comparative "poverty" of the rich, Mr. Mallock proceeds to estimate the number of taxpayers, and fixes it at rather more than 1,400,000 persons for 1910, whereas the most recent official estimate (in an answer in Parliament) gave 1,100,000. He achieves this point by the fashionable process of fitting taxpayers into houses, and makes the astonishing assumption that practically every 20*l.* house will furnish a "taxpayer," and that the general ratio of house rent to income is as 1 to 10. Even omitting London probably 25*l.* is quite low enough in fact, and the number of houses from 20*l.* to 25*l.* is more than enough in itself to account for the difference in the estimates. He says the assumption has received the "sanction of legislation," because the 20*l.* minimum for House Duty corresponds with the 160*l.* exemption limit! Unfortunately for this argument the income tax exemption limit, though 150*l.* when the House Duty was imposed, went to 100*l.* immediately after and has been altered twice since. Mr. Mallock makes insufficient allowance for several factors which tend to reduce the number of "significant" houses, viz., void houses, joint occupations, and houses technically liable. Then the classification of assessment (Schedules D and E) is called to his assistance. It is enough to say that with sufficient zeal and hardihood one can prove almost anything from this table. His faults in this case are failure to recognise the very large number of duplicate assessments under Schedule E on Directors' fees, &c., and under "Persons" for the ever multiplying items of Bank Interest, &c., which according to the official reports have doubled in the last four years. It is safe to assume that nearly all the assessments in the "under 160*l.*" class are duplicated so far as separate taxpayers are concerned, and these aggregate to well over 400,000. Mr. Mallock's use of these tables has always a very imposing appearance, but to anyone having a little acquaintance with them for practical statistical work, he is sometimes rather brutal, and never very convincing. But the chief defect of his estimate is that he makes no attempt whatever to reconcile his figures with the best *facts* we have, viz., the abatement figures. These, with any reasonable grading for the classes up to the super-tax range, would complete the rout. He refers to a ratio which was supposed to exist between "persons" and the total number of taxpayers thirty years ago, and uses it as corroborative evidence; unfortunately the connotation of the word is now quite different, as reference to the reports will show.

The book contains some effective illustrative stories—in one pretty allegory the necessary air of unreality is provided by a surveyor of taxes who was *also* a house-agent! J.C.S.

3.—*The Land: The Report of the Land Enquiry Committee.* Vol. I. *Rural.* xi + 498 pp., crown 8vo. London: Hodder and Stoughton, 1913. Price 1*s.* net.

It is not an easy task to review satisfactorily, from the standpoint of a scientific journal, so polemical a publication as this Report. With a portion of its facts and some of its conclusions the detached observer will probably agree, but the methods by which the data have been gathered are not calculated to win the confidence or retain the trust of scientific students. The tone and temper of its compilers may profess to be judicial, but they cannot avoid the suspicion of being partial; and the anxiety to prove a case is scarcely concealed. The irony of fate, indeed, by which British agriculture is receiving, in its days of a prosperity that seems gradually to be returning, the assiduous notice of active politicians, which was withheld entirely, or grudgingly bestowed, in the recent period of deepening depression, is more curious than fortunate. That increased attention is not, of course, confined to the particular party associated with the present publication, and both sides no doubt wish genuinely to help in their favoured ways some at least of the different classes occupied in agricultural pursuits. But the danger cannot be disregarded that an interest concentrating on the capture of votes is likely to be more conspicuous and influential than the cool unbiased care for the comprehensive collection, the strict scrutiny, and the veracious statement, of the full, exact, attested knowledge which is needed for forming right and wise conclusions. Such a menace to independent opinion is unhappily never removed very far from the unquiet arena of controversial politics.

To apply, therefore, to this book the tests which would be used, if we were trying to appraise an impartial contribution of enduring value to a scientific inquiry made by expert economists or informed statisticians might seem inappropriate. The Report at any rate falls manifestly below this standard. It may be doubted whether those who conducted the detailed investigations, or many at least of their informants, are more likely than those who set on foot the scheme, or are utilising its results, to escape the justified impeachment of a "wish to believe." Certainly the opportunity given by the open cross-examination of a Royal Commission drawn from various sections of the community, or even of a Departmental Committee manned by State officials, for sifting fact from hearsay, and for separating personal impressions of a more or less vague and general character from direct definite and proved knowledge, is denied to the reader of this Report. At the best he could by an exhausting expenditure of meticulous pains gauge imperfectly the amount and quality of the evidence on which its large generalisations rest. The statistics, for example, of the wages, or the total earnings in money and kind, of agricultural labourers, and of the cost of living, on which great stress is laid, have been criticised for a failure to fulfil the criterion of being properly comparable as respects both time and place; and such a defect may be considered characteristic. It betrays an incautious eagerness to make good a plausible argument. Nor, to select another example, which may also be treated as significant of the disposition of the interrogators or their answerers, can the observant student avoid noticing discrepancy between the quantity and force of the testimony cited on the actual harm resulting from the preservation of game to agricultural enterprise and the assured conviction marking the pronouncement of the Committee on that vexed topic.

These are only two examples; but, accordingly, while a great mass of material of more or less interest and value is offered to the buyers of this inexpensive volume, and, while a number of the facts, which may not perhaps be new, warrant the anxious meditation of all who desire and expect improvement in the circumstances of rural life, whether they concern the remuneration, the housing and the general prospects of the labourer, or affect the methods of farming, or the use made of the land for the benefit of the whole community, on the other hand the Report is not free from the taint of prepossession. The Introduction of the Chairman recognises some legitimate differences of view, and discriminates between varieties of landlords, farmers and labourers, but Dr. Slater's ***Historical** Outline* appears to commit the error of one-sided emphasis; and the object of justifying a legislative programme is responsible throughout, as we think, for prompting the anonymous as well as the acknowledged participators in the inquiry to seek, or select, or at any rate give the greater weight to, facts which are congruous with their theories.

The result, we venture to urge, is to be deprecated because the subject is one that, handled less combatively, might elicit from all parties no small measure of agreement. The objections raised in these pages to the idea of land-purchase may not indeed convince the advocates of such proposals. The cynical bystander might also comment grimly on the admitted failure of the vaunted legislation for small holdings to accomplish its more ambitious promise. But many observers, both from without and from within the ranks of agriculturists, will allow that there are directions, tolerably obvious, in which reform is necessary and possible. What is surely to be desired is that impetuous agitation should not in ignorance produce more harm than good even to those whom it would benefit, and that class-hostility should not be evoked as the motive, or employed as the guide, of legislators more concerned in consequence to damnify the landlord than to raise the labourer or to conciliate the farmer.

For this reason we have drawn attention at the beginning of this notice to the capricious destiny by which, at the moment when the economic position of British agriculturists is decisively if slowly mending, and greater prosperity has already caused labourers to benefit by the larger profits of farmers and the arrest in the fall of landlords' rents, hasty voices should interpose with promises that can hardly be fulfilled or with threats that are not impotent to discourage or deter. The intentions of those responsible for the preparation and issue of this Report are friendly to one, or even two, of the classes now linked together in British agriculture, but they do not dissemble their animosity towards the third, and consequently, while their inquiry may serve the useful office of drawing attention to some matters that demand remedial treatment, its political aim and partisan origin may exert an aggravating rather than a mollifying influence. At any rate it cannot be accepted by economic and statistical students as a satisfactory substitute for the slower but more authoritative and trustworthy investigation of a Royal Commission, or a State-appointed Committee.

L.L.P.

4.—*The Land. The Report of the Land Enquiry Committee.* Vol. II: *Urban.* xxxi + 728 pp., sm. 8vo. London: Hodder and Stoughton, 1914. Price 1*s.* net.

This is the second instalment of the report of the Committee, appointed by the Chancellor of the Exchequer, and presided over by Mr. A. H. Dyke Acland. It deals with that portion of the reference to the Committee by which they were instructed to obtain an accurate and impartial account of the nature and working of the existing systems of ownership, tenancy, taxation and rating of land and buildings in urban districts and the surrounding neighbourhoods, and the effect of those systems on industry and the conditions of life. The volume relates to England and Wales only. The method adopted was to obtain information in 101 selected towns and 16 metropolitan districts. These included a population of more than 16 millions. Further inquiries with regard to tenure of land were made in 268 towns. The head organiser of these inquiries was Mr. H. E. Crawfurd.

The question of urban housing, which is the main subject dealt with in this report, is truly described as one of deep and growing importance. The Committee divide urban working-men's dwellings into three classes—the "parlour house," the ordinary cottage, and the slum house. In the third class they include dwelling-houses whose sanitary defects are prejudicial to health, and houses so situate as to stop ventilation or prevent the remedy of nuisances in neighbouring buildings. Slums exist in London and other large cities, and also in small towns and mining villages. Many examples of this are given.

Other dwellings which would not be unsatisfactory if occupied by a suitable number of inhabitants are rendered insanitary by overcrowding. Bad housing, from whatever cause it may arise, produces deplorable physical and moral effects, and lowers the standard of life. The Committee find that a majority of the urban population live in houses that are defective; that a considerable proportion live in houses that are unfit; and that 10 per cent. have to live under conditions of gross overcrowding; yet the rents demanded for these dwellings are high. From a statistical table, based upon a partial investigation by the Committee, and including the results of Professor Bowley's independent inquiries at Reading (*Journal*, lxxvi) it appears that where the total family income is under 20*s*. rent (including rates) absorbs from 22 to 43 per cent. of that income; where it is 20*s*. and under 30*s*., from 16 to 27 per cent.; 30*s*. and under 40*s*., from 12 to 23 per cent.; 40*s*. and over, from 9 to 16 per cent. The Committee shrewdly observe that the amount actually paid in rent is something less than appears, inasmuch as back rents are often not paid and not recovered.

The inference to be drawn from these statements appears to be that the Housing Acts, as at present administered, do not meet the necessities of the case. The Committee seek to trace the reasons for the failure of the local authorities to effect greater improvement. Among these they attach importance to the shortage of alternative accommodation. This they consider to be especially acute at the present time. Among the causes to which they attribute it are the Finance Act of 1909–10, and the increased attractiveness of alternative investments. An interesting table is given, showing that the yield of "gilt-edged" securities has steadily increased since 1898 from *2l. 14s. 3d.* per cent. to *3l. 17s. 11d.* per cent. But shortage is, indeed, a normal condition. How, then, is the supply to be stimulated and made adequate? Who are to provide the dwellings in future? How is the future development of housing areas to be regulated? What is to be done with existing insanitary property? These are questions to which the Committee give detailed consideration. They allot a special chapter to the housing conditions of mining districts, which they consider to be decidedly worse than those of other industrial areas. They finally arrive at a series of fifteen recommendations for increasing the obligations and powers of local authorities, for establishing town planning schemes, for promoting transit, and the like; and in these they include the fixing a minimum wage for all low-paid wage earners, which is not to be less than the sum required to keep a family of normal size in a state of physical efficiency, and to enable them to pay an economic or commercial rent for a sanitary dwelling, and the taking steps to regulate the labour market. By what means these miracles are to be worked does not appear.

The second part of the present report relates to the acquisition of land. This is dealt with in two chapters. In the first the cases are considered where the land is required either by public bodies, such as the local authorities and Government departments, or by bodies such as railway companies, gas companies and water boards, which, as acting under statutory authority, may be considered for this purpose to be of the nature of public bodies. The existing law is clearly stated and inquiry made as to its working. The Committee recommend the extension of compulsory powers to public utility societies for the purpose of providing houses or small holdings, upon the condition that their profits are limited to 5 per cent.; the simplification of the practice for assessing compensation, and of the basis of compensation; and the repeal of some of the restrictions which now exist upon the acquirement of land for public purposes. They themselves qualify the alterations they recommend as "drastic." The second chapter deals with the acquisition of land by private persons or companies, and with wayleaves and easements. Upon this the Committee obtained a great volume of evidence, leading to the recommendation that a Government department should be authorised to extend to any applicant who could prove the necessity of the case power compulsorily to acquire land for industrial or commercial purposes, or for housing, or for the erection of churches, schools, chapels, institutes or reading rooms. In like manner a Government department should have power to order the compulsory granting of licences or wayleaves when required for mining purposes.

The third part of the book deals with the subject of tenure. The various forms of tenure are described, and a map is furnished showing the districts in which each form prevails. It need hardly be said that the Committee approve of the compulsory enfranchisement of copyholds, and recommend amendments of the law relating thereto in the interest of the tenants. They give a history of the leasehold system, and a statement of the grievances which arise in connection with short leaseholds—that is, leases for twenty-one to ninety-nine years. They recommend security of tenure for leaseholders, subject to considerations of public interest, when compensation should be awarded, and an appeal against arbitrary action by lessors. They describe the system of leases for lives, and recommend its prohibition. For long leaseholds—that is, leases for more than ninety-nine years—they make similar recommendations to those in respect of short leases. With regard to tenure of land generally they recommend the abolition of the law of primogeniture in cases of intestacy.

The fourth part of the book deals with the subject of rating. Upon this important branch of their inquiry the Committee make a series of recommendations as to the basis of assessment, to the relation between imperial and local taxation, and to valuation and assessment, which, if adopted, would have a far-reaching effect. They include a recommendation that all future increases in local expenditure should be met by a rate upon site values, but that no additional burden should be imposed upon agricultural land ; that further relief should be granted to local rates out of Imperial taxation, and provision made for the adjustment of local boundaries without recourse to Parliament ; and that the law should require every property to be revalued at least once in every five years, and, if practicable, annually.

Whatever may be thought of the recommendations of the Committee, some of which, even if they availed to remedy acknowledged evils, might give rise to other and possibly greater mischiefs, it must be acknowledged that their strenuous labours have produced a store of statistical and other information that cannot but be of great value.

E.B.

5.—*The Land Retort.* By Charles Adeane and Edwin Savill. xx + 153 pp., small 8vo. London : John Murray, 1914. Price 2*s* 6*d*. net.

This little book is described on the title-page as a " study of the " land question with an answer to the report of the secret inquiry " committee." While its authors are mainly concerned with the exposure or rebuttal of erroneous impressions which, they think, are now being spread through the country by emissaries coached in the views, and imbued with the animus, of the committee whose credentials and conclusions are here impugned, they have also contrived within the limited compass of a handy essay to furnish from their own comprehensive and discriminating knowledge of agricultural conditions not a few serviceable hints of the direction that wise reform may opportunely take. They do not assert that all is well with every part of English rural life at the present moment; but they maintain, and show cause for their contention, that the picture offered by Mr. Lloyd George and his friends is a defective representation of the facts. The Report of the Land Inquiry Committee dealing with rural matters, Mr. Adeane and Mr. Savill argue, errs both by commission and by omission. Its colouring of some acknowledged shortcomings is, they hold, exaggerated; and it fails to bring into prominence some important circumstances of a more encouraging character and hue in the actual situation.

The labourer, for example, is not so poorly paid, so badly housed, or so universally down-pressed, as eager friends seeking his political support, affirm. The farmers, again, are not as insecure in the tenancy of their holdings, so far as their existing landlords are concerned; nor are they hampered in reality in their farming enterprise by the demands of sport in the manner and degree stated by anonymous informants whose credibility cannot be impartially examined. Nor, once more, are the inquirers, who try, curiously enough, to play the double rôle of favouring advocate and hostile critic of the tenant, according as they face the landlord or the labourer in turn, more correct in their sweeping animadversions on defective cultivation of the soil. Their comparisons with foreign yields to intensive culture are drawn with as hasty a regard to the surrounding circumstances as their statistics of British wages and earnings and of the expense of living in the country-side have been loosely compiled. Their suggested remedies too are of dubious benefit; and, while there is no magic indisputably in the possession, or at the command, of a "land-court" for fixing satisfactorily a rent which is "fair," the serious difficulties and drawbacks attendant on the settlement of a "minimum wage" in such a large and varied industry as agriculture have not been considered with sufficient pains by those who recommend this expedient.

Such are the chief arguments of the authors of this little brochure, and it is because they are evidently familiar with the subjects which they handle that their criticism of the Report is impressive. We are disposed to place their book on that account alone among the best of the replies, now somewhat numerous, evoked by the inquiry set on foot by the Chancellor of the Exchequer. They are writing, it is clear, on what they know; and, moreover, they do not merely desire to state a case. But nevertheless, the suspicion or disgust, which they avow, for the document they are scrutinising, while it may lend support to the reproach that they are not wholly impartial, also gives vigour to their treatment. If their book is too short to pretend to be exhaustive or profound, it has the merit of being readable, and, in fact, there are few important issues in the controversy on which it does not touch with effect.

L.L.P.

6.—*Economie politique et statistique.* Par Ch. Lordier. xi + 604 pp., 8vo. Paris: H. Dunod et E. Pinat, 1914. Price 15 francs.

The economist will not find in this work any original contribution to the theory of economics, nor will the statistician find any similar contribution to his own particular science. But the book must not be judged on this ground. The author is a civil engineer, and his purpose is to introduce his professional confrères to the principal questions covered by economics, which are of more or less practical interest, and to some applications of statistics. There is, however, nothing in the book which need restrict its circle of readers to engineers only. Regarded, then, as an introductory text-book, the work is both useful and disappointing. It is useful in its comprehensive survey of economic matters, and especially in the large amount of purely descriptive matter which it contains. The author has deliberately devoted much of his space to descriptive or applied economics in preference to exhaustive discussions of pure theory. His definition of political economy is a generous one, covering the study of the laws which govern the formation and functioning of society, although he does not attempt in his treatment of the subject to roam over the whole field here opened up.

Apart from brief introductory and historical notes, the work is divided into several sections dealing with production (under land or nature, labour, and capital), the circulation of wealth (including value and price, money, credit, transport and other public works, and commerce), the distribution of wealth (the share of property, the State, capital, and labour), the consumption of wealth (including savings and insurance), and Statistics. Most of the topics found in ordinary text-books are there, but the arrangement is in some cases peculiar. For example, population is considered under the general head of "Capital," and the subhead "relation of production and consumption," and taxation finds its place in the section dealing with the share of wealth falling to property. Anyone not already acquainted with economics can therefore get from this book an idea of the general subject-matter of the science, and incidentally gather a good deal of information about existing economic affairs in France and elsewhere.

But the serious student will find the book unsatisfying. The multiplicity of subjects introduced has made it impossible for the author's treatment of many of them to be anything but superficial and fragmentary. As an instance may be mentioned the dismissal of the subject of the Minimum Wage (referred to by the author as the "Living Fee") in a few lines on p. 473. This defect would have been to some extent mitigated if the author had given references to authorities where the several subjects might be further pursued.

The author's views on some important points may be referred to. He excludes from the definition of capital all wealth (such as clothes and food) devoted to the satisfaction of purely personal wants, and accepts the theory that certain things may be both capital and non-capital according to their use (*e.g.*, coal burnt in an engine is capital, but that burnt in a grate to give warmth is not capital). From the social point of view he considers that the bread in a baker's shop is not capital, although admitting it as capital from the individual point of view. A further application of the author's acceptance of the division of wealth into productive and unproductive is seen in the section on credit. Credit granted to anyone for purposes of consumption (*e.g.*, to enable him to obtain food) "renders no service from the general point of view, "since it does not augment the productive forces, and contributes "only to the satisfaction of a personal want" (p. 166). Does not credit granted to unemployed workers to enable them to maintain both their life and their strength render no service to society?

In the matter of international trade the author leans towards protection in the early stages of a country's development. He also puts forward the view that the importation of a foreign commodity, which, on account of its cheapness, displaces a home product, results in a net loss of labour (p. 308). Apart from the fact that a diminution of the effort required to gain a particular commodity is generally an advantage, there is no reason, in face of the illimitable wants of mankind, why the labour previously required to produce the domestic article should not, in time, be available to produce a less quantity of the domestic article *plus* the goods required to purchase the foreign article *plus* something else (or *plus* more of the foreign article than is surrendered of the domestic article).

As regards taxation, which is treated very briefly, the author doubts whether the principle of progressive taxation is more equitable than that of proportional taxation (p. 396).

From these few examples it will be seen that the author's views are not likely in all cases to find universal acceptance.

About 70 pages are devoted to Statistics. There are a few general remarks concerning averages and the collection and compilation of statistical material; a brief account of the authorities responsible for official statistics in France; while the bulk of the section is concerned with graphical or geometrical applications of statistics. Not all of the latter are as practical as they may appear. For example, diagram 13 is designed to show the rate of tax on any commodity which will produce the maximum yield. It is supposed that the consumption curve of the commodity, for different rates of the tax, is known, but this is just the fact which cannot be definitely known. Taxes cannot be altered rapidly enough to give this information, and size of population, wealth, and habits are variable factors which influence the yield of any particular tax.

The book contains a detailed table of contents, but it would have been improved by the addition of an index. A.D.W.

7.—*L'Allemagne en France.* Par Louis Bruneau. xii + 343 pp. 8vo. Paris: Plon, Nourrit et Cie., 1914. Price 3.50 francs.

The author of this book is one of that school of French writers who are obsessed by the "German peril" in its economic form, and believe that German policy consciously aims at reducing France to the position of a mere dependency, from the industrial standpoint, of her powerful eastern neighbour. In order to endeavour to awaken his countrymen to a realisation of the danger M. Bruneau has undertaken a detailed investigation of the nature and extent of the German interests which have established themselves in France; and the volume before us sets out the results of his research so far as they relate to mining, the metallurgical industries, and the chemical industries (including dyes and colours, drugs, glues and artificial manures).

He has brought together a large amount of interesting and suggestive information as to German activity in these various lines; but his book is in the main merely a statement of facts, and there is little or no discussion of their economic significance and relation to national economy, and no definite indication of the remedies which the author would propose for the evils he describes, if evils they be. M. Bruneau appears to object equally to the grant of mining rights to German interests (often partially concealed behind a French façade); the acquisition by German manufacturers of existing industrial undertakings in France, or their establishment of new ones there; the giving of Government and other public orders to non-French contractors (in this case alone is there any discussion of the case on its merits, and it is noteworthy that the result is inconclusive); or even the purchase of German products by the general public. He is perhaps most troubled by the hold obtained by German iron and steel concerns over portions of the vast iron-ore deposits in French Lorraine and Normandy, which have been developed so rapidly in the last decade; and believes that these acquisitions have been dictated by the conviction that, even if there be no increase in the rate of consumption, the German ore deposits will be exhausted in 40 years. No doubt there might be in such acquisitions a real menace to the French iron industry, and a possible case for their restriction or prohibition, if they were likely to become very extensive and to be used solely for supplying works in Germany; but the first contingency seems very remote, and it is important to observe that German metal interests (notably those associated with Herr Thyssen and with the Gelsenkirchen Company) are actually establishing manufacturing works in France, as are German concerns in other branches of industry. Few protectionists, we imagine, have hitherto objected to an influx of foreign capital for industrial purposes, or the establishment of businesses by foreign enterprise, but M. Bruneau certainly does so; and this is the more curious because, with that tendency to depreciate the abilities of his own countrymen which characterises so many writers of his politico-economic cast of thought, he constantly complains of the low standard of technical training and business ability which prevails in France. We should have thought that M. Bruneau would have welcomed the advent of certain great German firms, whose achievements hitherto are the subject of his glowing eulogies, and whose action must tend to increase the resources and industrial efficiency of his country.

M. Bruneau promises other results of his researches in a second volume. We venture to hope that in that volume, besides a careful record of facts such as that now before us, we may be given a full analysis of the evils with which, in M. Bruneau's judgment, they threaten the national economy of France, and a statement of the precise measures by which he would propose to avert the peril.

P.A.

8.—*American Railroad Economics: A Text-Book for Investors and Students.* By A. M. Sakolski, Ph.D., Staff Lecturer in New York University School of Commerce, Accounts and Finance. xii + 295 pp., 8vo. New York: The Macmillan Company, 1913. Price 5*s.* 6*d.* net.

Here is yet another book on railway economics, this time specially distinguished as American. Railway economics is a wide term. It covers everything from pure theory, such as Professor Edgeworth's *Theory of Railway Rates*, and Professor Pigou's discussion on joint cost and "monopoly of the third degree"—treatises which soar into an empyrean whither the plain man cannot attempt to follow—to a severely practical work such as the volume before us. Naturally Mr. Sakolski's book, being intended for Americans, is of more value to them than to foreign readers. But it should be of considerable value to at least two classes in England. The first class is the investor who desires to invest intelligently; for he will find here amongst other things a very good description of the leading classes of railroad securities, and will be able clearly to understand the difference between a blanket mortgage, an underlying bond, a debenture, and so forth; and secondly, he will find the great railroads of the United States grouped geographically and *traffically*, if one may coin the word, and also according to their system affiliations. These two things are in special chapters. But the whole book will be useful to anyone who desires to read the accounts and balance sheet of a railway company intelligently. It tells him what to look for; not only what is given in the figures, but also what may be behind them. Young railway officials in this country will also find the book helpful, especially in teaching the avoidance of unsafe comparisons. Adequate comparison of English railways with one another on the mere basis of their published figures is, of course, impossible. Even with the exhaustive data of the published reports of the American railways, comparisons are dangerous unless made with judgment and with knowledge of the differences geographical, financial, historical, &c., &c., which lie behind. And yet comparisons have to be made. A student who carefully reads Mr. Sakolski's book can hardly fail to get new points of view opened up to him, and to learn to make the comparisons which he has to make for himself more intelligently and adequately than he would otherwise have done. Mr. Sakolski's comparison of the operating statistics of the 'Frisco and the Rock Island is an illuminating example of how work of the kind should be done.

The book is one of detail and does not therefore offer a peg on which a reviewer can hang any discussion of broad generalisations. But it can be recommended as a really useful addition to the practical railwayman's library alongside of books like Woodlock's *Anatomy of a Railway Report,* and Eaton's *Railroad Operations and How to Know Them.* W.M.A.

9.—*Other New Publications.**

Brissenden (*Paul F.*). The Launching of the Industrial Workers of the World. University of California Publications in Economics. Vol 4, No. 1. 82 pp., 8vo. Berkeley, 1913.

[A short account of labour organisations in the United States and of the events which led to the formation of the "I.W.W.," or Industrial Workers of the World, the main reason being the conviction that the labour unions of America were losing their power to obtain real benefits for working men and women. There is an extensive bibliography, though the movement dates only from 1905.]

Gaskell (*T. Penn*). The Coming Great Depression in Trade. 35 pp., 8vo. London: P. S. King and Son, 1914. Price 6*d.* net.

[The author's endeavour is to point out the probability of a coming depression in trade and its possible dangers to this country, though he admits that his pessimism may be without foundation.]

Lloyd (*G. I. H.*), M.A. The Cutlery Trades. An historical essay in the economics of small-scale production. xvi + 493 pp., 8vo. London: Longmans and Co., 1913. Price 12*s.* 6*d.* net.

[The author, while teaching at Sheffield University, was impressed by the contrast presented by the two great trades of the locality, namely, the ancient cutlery trades and the modern heavy steel industry, and it seemed worth while to him to give an historical account of the older trades and their rapidly disappearing features. The book is therefore mainly retrospective, though the present situation of the trades has not been neglected. Among the subjects touched upon are the old processes of manufacture, raw material, and rise and localisation of the industry and its industrial organisations. In regard to the modern industry the author deals with the earnings and forms of employment, the health of the workers, trade unionism, the sectional trade societies, commercial development of the industry, and the industry abroad. There are some sixteen appendices consisting mainly of tabular matter, and many illustrations.]

Owen (*Douglas*). Ocean Trade and Shipping. (The Cambridge Naval and Military Series.) ix + 277 pp., 8vo. Cambridge: The Cambridge University Press, 1914. Price 10*s.* 6*d.*

[This book, which is more of the nature of an explanatory work rather than a technical treatise, gives a brief description of the whole host of separate industries and undertakings which come under the head of Ocean trade and shipping, and the author is not aware that the whole collectively has been dealt with before. The work is intended primarily for naval and military officers to whom knowledge of this nature is important.]

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* See also "Additions to the Library," page 700, *sqq.*

Smart (*William*). An Introduction to the Theory of Value on the lines of Menger Wieser and Böhm-Bawerk. 3rd edition. x + 104 pp., 8vo. London: Macmillan and Co., 1914. Price 1*s*. 6*d*.

[The first edition of this book was reviewed in the *Journal* for June, 1892, and the present edition is a reprint of the 1891 edition with a few verbal alterations, press of other work having prevented the author from fulfilling his intention of revising the book in accordance with the later developments of the Austrian school of political economy.]

Tillyard (*E. M. W.*). The Athenian Empire and the Great Illusion. (Garton Foundation essay.) 36 pp., 8vo. Cambridge: Bowes and Bowes, 1914. Price 1*s*. net.

["The object of this paper is firstly to show briefly that in an important period of history the application of Mr. Angell's ideas dispels a number of current illusions, and secondly, to detect any signs of that interdependence of nations which he seems to consider to be merely of recent growth."]

Verinder (*Frederick*). Land, Industry and Taxation. 94 pp., 8vo. London: T. C. and E. C. Jack, 1914. Price 6*d*.

[This little volume forms one of the series of "The People's Books," and gives a brief account of the existing system of taxation in this country. The possibilities of reform are suggested in certain proposals, *e.g.*, the taxation of land values.]

Worsfold (*W. Basil*), M.A. The Future of Egypt. (The Nation's Library.) 263 pp., 8vo., portrait. London: Collins, 1914. Price 1*s*. net.

[This book gives a short description of Egypt and its inhabitants and of the conditions under which it came under British control, and the results obtained during the thirty odd years in which England has governed the country are reviewed. The author deals also with the aspirations of Egyptian nationalism and discusses the social conditions and emancipation of the *fellaheen*.]

Zattini (*Ing. Giuseppe*). Superficie e Popolazione del Regno d'Italia. 66 pp., 8vo. Roma: G. Bertero, 1913.

Belgium. Enquête sur la Pêche maritime en Belgique. Part 2. Etude sociale de la pêche maritime. x + 596 pp., 8vo. Bruxelles: Lebèque and Co., 1914. Price 4 frs. 50 c.

[This volume completes the inquiry, ordered to be made by the Belgian Government, into the economic and social conditions of Belgian sea fishermen. It follows the lines of the earlier inquiry, but includes also information on comparative maritime law, as the field of this industry is largely open to international enterprise. The report is divided into twelve chapters, dealing with such subjects as the training and methods of employment of the men, and earnings, housing conditions on shore, provident institutions and their relation to recent industrial legislation.]

Norway. Rapport sur le développement de la commune de Christiania, 1887-1911. ix + 502 pp., la. 8vo. Christiania: J. C. Gundersen, 1914.

[A general description and survey of the methods of administration of Christiania and of its development during the past twenty-five years.]

CURRENT NOTES.

The trade returns for the past month are upon the whole satisfactory, taking into consideration that the month had two working days less than April, 1913. The subjoined figures compare the twelve months ending April, 1914, with the twelve months ending April, 1913:—

[000's omitted.]

Imports.	Twelve months ending April, 1914.	Twelve months ending April, 1913.	Increase (+) or Decrease (−).
Imports, value c.i.f.—	£	£	£
I. Food, drink and tobacco	292,803,	282,747,	+ 10,056,
II. Raw materials and articles mainly unmanufactured	278,023,	278,706,	− 683,
III. Articles wholly or mainly manufactured...........................	194,344,	191,180,	+ 3,164,
IV. Miscellaneous and unclassified (including parcel post)	3,279,	2,994,	+ 285,
Total* merchandise....................	768,151,	755,627,	+ 12,524,
Imports of bullion and specie	72,983,	71,340,	+ 1,643,

[000's omitted.]

Exports.	Twelve months ending April, 1914.	Twelve months ending April, 1913.	Increase (+) or Decrease (−).
Exports of produce and manufacture of the United Kingdom, value f.o.b.—	£	£	£
I. Food, drink and tobacco	33,313,	31,801,	+ 1,512,
II. Raw materials and articles wholly unmanufactured	70,272,	66,968,	+ 3,304,
III. Articles wholly or mainly manufactured	413,375,	397,123,	+ 16,252,
IV. Miscellaneous and unclassified (including parcel post)	11,674,	10,183,	+ 1,491,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	16,394,	15,093,	+ 1,301,
II. Raw materials and articles mainly unmanufactured	63,311,	67,224,	− 3,913,
III. Articles wholly or mainly manufactured	28,824,	29,132,	− 308,
IV. Miscellaneous and unclassified (including parcel post)	133,	162,	− 29,
Total* British, foreign and colonial	637,000,	617,686,	+ 19,314,
Exports of bullion and specie	65,045,	63,592,	+ 1,453,

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* In compiling these totals, the revised figures now available for the aggregate trade of 1913 have been used; the revised figures for the several classes of imports and exports have not yet been published.

[000's omitted.]

Shipping.	Twelve months ending April, 1914.	Twelve months ending April, 1913.	Increase (+).
	Tons.	Tons.	Tons.
Total, British and foreign, *entered* with cargoes	49,192,	47,224,	+ 1,968,
Total, British and foreign, *cleared* with cargoes	67,862,	67,021,	+ 841,

Mr. Sauerbeck's index-number of prices for April, as given in the *Statist* is 82·3, as against 82·8 in March, the average of the eleven years 1867-77 being taken as 100. The fall occurred chiefly in materials, the index-number for which is 88·0, against 88·8 in March. The food index-number is 74·6 against 74·7 last month. The *Economist* index-number stands at 2,585, as compared with 2,597 in March.

According to the Board of Trade *Labour Gazette*, the state of the labour market last March was as follows:—

	Trade Unions making returns. Net membership.	Reported as unemployed.	
		Number.	Percentage.
March, 1914	988,164	21,426	2·2
February, 1914	976,988	22,726	2·3
March, 1913	908,276	17,533	1·9

Employment in March showed no marked change as compared with February, and was still good. There was some falling off in iron and steel manufacture, but the engineering and shipbuilding trades continued busy. The woollen and worsted industries improved, but linen and jute declined. The building and woodworking trades showed a further seasonal improvement, and employment at coal mines remained very good. It was reported by the Labour Exchanges that there was a continuance of the demand for labour in the shipbuilding trades. There was also a deficiency of women in the clothing trade and in the linen trade in the Dunfermline district. Compared with the high level of March, 1913, employment generally showed a decline. The coal mining, iron and steel, engineering, shipbuilding and textile trades were not so active, and there was a considerable decrease in the number of pig-iron furnaces in blast. On the other hand, there was a substantial improvement in the tinplate trade and some upward movement in the building, woodworking, printing and glass trades.

The Journal of the Royal Colonial Institute, *United Empire*, for May, contains a Paper by Dr. C. V. Drysdale on the "Empire and "the Birth-rate," read at a meeting of the Institute on March 24. The questions considered by the lecturer were (i) What are the actual facts as regards the variation of the birth-rate in our own country and in different parts of the Empire? (2) What changes have taken place simultaneously as regards the numbers, the health, and the character of the inhabitants? (3) What are the corresponding changes and results in other nations? (4) What ought to be the attitude of a true Imperialist towards the birth rate question in view of the evidence available? The answers to the statistical portion of these questions are illustrated by diagrams. After the figures in detail, Dr. Drysdale stated his conclusion to be that large numbers and national efficiency were not to be secured by a high birth-rate, especially in the lower state of society. High birth-rates to-day invariably meant high general and infantile death-rates, and "when accompanied by humanitarian "legislation, a serious process of reversed selection." From the example of Holland he drew the inference that a further fall in the birth-rate among the poorer classes would be accompanied by an immediate and progressive improvement in their conditions, by a checking of the output of physical and mental defectives, and by a gain in the national efficiency, and probably also in the rate of increase in our population. In the interesting discussion which followed the reading of the Paper, Lord Sydenham and Mr. Harold Cox, among others, took part.

A series of three public lectures on "Vital Statistics" were delivered by Mr. Joseph Burn, F.I.A., F.S.I., Actuary of the Prudential Insurance Company, in the Liverpool University, on April 29, May 6 and May 13 respectively. In the first lecture, after referring to the greatly improved form in which the census statistics are now published, the lecturer gave some interesting details in connection with the first census which was taken by (1) Great Britain, (2) Japan, and (3) Russia. The first census for Great Britain was effected in 1801 after considerable opposition, as many thought that it was merely a preparatory measure for some more efficient plan of taxation, whilst others, possibly with painful experiences of the Press Gang, imagined that some new scheme was to be anticipated in respect to the levy of the militia. A remarkable feature was pointed out with regard to the populations of France, and England and Wales, viz., that France has a population nearly three millions in excess of this country, and yet for persons aged 52 and under the populations are the same. Other interesting facts were given, among which may be noted that the French and German women living between ages 15 and 45, that is, the child-bearing ages, are 8,834,000 and 14,831,000 respectively. These figures were of importance when considered in relation to the corresponding numbers only ten years earlier, viz., about 8,750,000 and 12,766,000. Whereas the German females had increased by 16 per cent. at the reproductive ages, the similar class in France had remained practically stationary. Another interesting statement was that 168,000 persons were living between ages 35 and 40 in 1911 who would all have died in the ten years 1901-11, if the rates of mortality had been equal to those experienced in the ten years 1871-81.

In the second lecture Mr. Burn dealt with the Annual Reports of the Registrar-General, with special reference to the number and causes of death, and the indications of the progress of Sanitary Reform. Many interesting facts were given with regard to the annual marriage-rate in this country, *e.g.*, whereas in 1881 there were on the average 59 marriages per annum amongst spinsters aged 15 and upwards, in 1911 there were only 50·8. A fact which is less generally recognised, the lecturer said, was the increasing average age of women at marriage; thus marriages amongst young women under 20 were becoming much more rare. This point was of great importance because statistics showed that "there is found "to be a level chance of 9 children being the limit when the wife "at marriage is aged 17; of 8 children being the limit when the "age is rather less than 20; of 7 children when that age is rather "less than 22; of 6 children when that age is between 23 and 24; "of 5 children when that age is between 25 and 26; of 4 children "when that age is between 28 and 29, and so on." The effect of sanitary reform was then traced in the reduction in the number of deaths among children under 5 years of age. Thus, whereas for the years 1861-70 the annual death-rate was 68·6 per 1,000, in 1911 it was only 43·7. Diagrams were given tending to show that scarlet fever was nearly subjugated, but that strenuous efforts were still required in the warfare against other infantile diseases. After giving a simple explanation of crude and standardised death-rates, Mr. Burn dealt with the death-rate from various diseases.

In the third lecture the Hollerith Sorting and Tabulating Machine was described, but the main part of the lecture dealt with the subject of Mortality Tables (*a*) National, (*b*) Municipal, (*c*) Occupational. With regard to Occupational Tables, while recognising the extreme value of such tables Mr. Burn said that the difficulty of obtaining the data required for their construction was practically insuperable. He pointed out that persons engaged in unhealthy occupations take up other occupations on becoming invalided. When death occurs they are described as following the latter occupation, and the mortality of the unhealthy occupation to which such death should be ascribed is in consequence understated. Dealing with local tables, a Liverpool mortality table constructed for the purpose of this lecture was shown, and the lecturer thought that it should be the ideal of each district that its rates of mortality should compare favourably with those of the general population. In bringing the lecture to a conclusion, Mr. Burn emphasized the importance of the fuller details now made available by the Registrar-General. "Am I too sanguine," he asked, "in hoping that now we "have all the necessary statistics, there may be at least one person "in each important centre who will periodically construct tables of "mortality for his own district on some such lines as those which "I have described showing the analysed mortality rates referring "to the various principal diseases? If this is done I am confident "that it must have beneficial results. The progress which is being "made will be clearly denoted. There will no longer be any excuse "for acting in ignorance since the table will show exactly what is "happening, so that all conscientious workers for sanitary reform "will be able to discover at once the direction in which it is most "desirable to concentrate attention."

A course of nine lectures on "Social Progress in the Light of "Recent Research" is being delivered at the London School of Economics and Political Science, Clare Market, Kingsway, W.C., by Professor J. H. Muirhead, LL.D., under the auspices of the Ratan Tata Foundation of the University of London. The lectures are at 6 p.m. on Fridays, beginning May 1, 1914, and are open to the public without fee. The lecturer is dealing with the subject under the following heads, viz.: (i) The idea of progress in general; (ii) the meaning of social progress; (iii) the dynamics of progress; (iv) conditions of progress; (v) and (vi) progressive politics; (vii) social and racial progress; (viii) education as a progressive force; and (ix) social work.

A course of six elementary lectures is being given in the Department of Applied Statistics and Eugenics of the University of London on "Computing; and some Mechanical Aids to Calculation." The lecturer is Mr. H. E. Soper, M.A., Assistant in the Department of Applied Statistics, and the lectures are being delivered on Tuesdays, May 5, 12, 19 and 26, and June 2 and 9, at 6 p.m. The course is intended to give a brief survey of invention in counting and recording numbers, performing the simple operations of arithmetic, and evaluating numerically statistical functions and formulæ. Further particulars may be obtained from Mr. Walter W. Seton, Secretary of University College, Gower Street, W.C.

At a conference on agricultural statistics recently held at Ottawa between representatives of the Dominion and Provincial Governments, a resolution was unanimously passed that a census of the areas and yields of the principal field crops and of the numbers of live stock should be taken annually, and that a more complete and accurate census should be carried out every fifth year. It was also generally agreed that the reform desired would be best secured by a well-considered scheme of co-operation between the Dominion and Provincial Governments, and that the Dominion Government, after consultation with each of the Provincial Governments, should draft a scheme as a basis for discussion at a further conference to be subsequently convened.

The following gentlemen, among others, were elected Honorary Members of the American Statistical Association on the occasion of the celebration of the seventy-fifth anniversary of the Association: Sir J. Athelstane Baines, C.S.I., Major P. G. Craigie, C.B., Dr. A. Newsholme, C.B., and Mr. G. H. Knibbs, C.M.G.

Dr. Jules De Vargha has resigned the position of Director of the Central Statistical Office of Hungary on appointment as Secretary of State for Commerce. Dr. De Vargha had been Director of the Statistical Office for thirteen years.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Bankers' Magazine. May, 1914—Banking reform in the United States. Progress of Banking in Great Britain and Ireland during 1913. No. 4. Proportion of cash to deposits. Canadian banking in 1913.

Britannic Review. May, 1914—The Georgian Bay Canal: *Perks* (*Sir Robert, Bart.*). Organisation of imperial trade: *Hirst* (*Hugo*). Canada-West Indies preference dilemma: *Hay-Tracy* (*Harold*).

Economic Review. April, 1914—The census of production and agriculture: *Wilsden* (*L. W.*). Municipal wage disputes: *Macgregor* (*Prof. D. H.*). Municipal efficiency: *Leigh* (*J. G.*). The Australasian precedent in social legislation: an example or a warning? *Egerton* (*Prof. H. E.*). Professor Smith and Dr. Marshall: *Sargant-Florence* (*P.*).

Financial Review of Reviews. May, 1914—The depression in the shipping industry: *Wright* (*Arnold*). The inherent wealth of Brazil: *Oakenfull* (*J. C.*). Labour unrest and the rise in prices: *Kershaw* (*John B. C.*).

United Empire (*Royal Colonial Institute Journal*), 1914—

April—Commercial developments in the German Kamerun: *Leonard* (*Major A. G.*). Zanzibar and its possibilities: *Galbraith* (*A. R.*).

May—The Empire and the birth-rate: *Drysdale* (*C. V.*).

UNITED STATES—

Journal of Political Economy. April, 1914—The Banking and Currency Act of 1913: *Laughlin* (*J. L.*). The financial policy of the federal reserve banks: *Conway* (*Thomas, Jun.*). Banking reserves under the Federal Reserve Act: *Scott* (*W. A.*). Collecting checks under the Currency Law: *Woodruff* (*George*). The relation of the new Currency Act to the work of commercial paper houses: *Schaffner* (*R. C.*). Constitutional restrictions on municipal debt: *Secrist* (*Horace*).

Yale Review. April, 1914—The Federal Reserve Act of 1913: *Sprague* (*O. M. W.*). Rural co-operation: *Chapman* (*Edward M.*).

CUBA—

La Reforma Social. April, 1914—La inmigración china y el Canal de Panamá: *Guiteras* (*Dr. Juan*). Adolfo Bertillón y su sistema antropométrico: *Ortiz* (*Dr. Fernando*). El problema social en Alemania: *Pérez* (*Luis Marino*).

FRANCE—

Bulletin de Statistique, Ministère des Finances. March, 1914—Loi concernant la contribution foncière des propriétés bâties et non bâties et l'impôt sur le revenu des valeurs mobilières françaises et étrangères. Produits des contributions indirectes pendant l'année 1913. Les recettes des théâtres et spectacles de la ville de Paris (1850-1913).

FRANCE—*Contd.*

Journal des Economistes. *April*, 1914—Les programmes économiques: *Guyot* (*Yves*). Le bilan de la contrainte dans la prévoyance sociale: *Bellom* (*Maurice*). Les comptes des chemins de fer de l'État: *Nouvion* (*Georges de*). La situation économique et financière de l'Argentine à la fin de 1913: *Lafond* (*Georges*). La suppression des délimitations administratives au Sénat: (*Fernand-Jacq*). Le traité de commerce russo-allemand et l'Allemagne exportatrice de céréales: *Hochschiller* (*Max*). Angleterre et Allemagne: *Raffalovich* (*A.*).

Journal de la Société de Statistique de Paris. *April*, 1914—La monnaie de papier: (*Théry Edmond*). L'évaluation des propriétés non bâties: *Guyot* (*Yves*). Observations sur "L'évaluation des propriétés non bâties": *Michel* (*M.*).

La Réforme Sociale. 1914—

April 16—L'enfance malheureuse en France. La protection de la première enfance: *Charpin* (*Frédéric*). Régionalisme et représentation professionnelle: *Boucheron* (*Louis*).

May 1—L'organisation de la bienfaisance aux États-Unis: *Escard* (*Paul*). L'enfance malheureuse en France: la protection légale de l'enfance: *Charpin* (*F.*). Les crises d'essor économique et la situation actuelle: *Mourre* (*M. le baron Charles*). Le mouvement économique et social: *Lepelletier* (*F.*).

Revue des Sciences Politiques. *April*, 1914—La crise du caoutchouc et les colonies françaises. L'état financier de la Turquie: *Savary* (*H. R.*). Chronique des questions ouvrières (1913): *Festy* (*O.*).

GERMANY—

Archiv für Sozialwissenschaft und Sozialpolitik. *March*, 1914—Die englische Agrarreform: *Levy* (*Prof. Hermann*). Das Taylorsystem und seine volkswirtschaftliche Bedeutung: *Kochmann* (*Dr. Wilhelm*). Beiträge zum Problem des Neomalthusianismus: *Berta* (*Luigi*). Der städtische Grund und Boden in England: *Loewenstein* (*Dr. Arthur*). Die Kapitalbildung in Finnland: *Hjelt* (*Dr. Aug.*).

Deutsches Statistisches Zentralblatt. *April*, 1914—Der statistische Unterricht vor dem Forum der deutschen Hochschulen: *Schmid* (*Dr. Ferdinand*).

Jahrbücher für Nationalökonomie und Statistik (*Conrad's*). *April*, 1914—Die Reichsbesitzsteuer: *Strutz* (*G.*). Ueber die wirtschaftliche Verwertbarkeit des Erbbaurechts in seiner heutigen Gestaltung: *Salomon* (*Max*). Die wirtschaftliche Gesetzgebung des Deutschen Reiches in Jahre 1913. Die Produktivgenossenschaft der Hohlperlenerzeuger im politischen Bezirk Gablonz. Ein Epilog: *Aubin* (*Gustav*). 800 Jahre europäischer Steinkohlenbergbau: *Husmann* (*W.*). Die Lohnklassen in Bochum. Die Zunahme der Bevölkerung in den hauptsächlichsten Kulturstaaten während des 19. Jahrhunderts: *Müller* (*Johannes*).

GERMANY—*Contd.*

Zeitschrift für Socialwissenschaft. Heft 5, 1914—Die Preiskurve und das Teuerungsproblem: *Glier* (*L.*). Sozialhygiene und Eugenik: *Schallmayer* (*W.*).

ITALY—

Annali del Seminario Giuridico della R. Universita di Palermo. Volume 2, 1913—La correlazione fra la statura e l'indice cefalico secondo le statistiche antropometriche militari italiane: *Turroni* (*C. Bresciani*). Sull' uso dei metodi della variabilità e della correlazione nell' economia induttiva: *Turroni* (*C. Bresciani*). Studi sulle variazioni stagionali di alcuni fenomeni demografici: *Turroni* (*C. Bresciani*). La ricchezza delle città: *Turroni* (*C. Bresciani*). La variazioni "cicliche" dei prezzi: *Turroni* (*C. Bresciani*).

Giornale degli Economisti e Rivista di Statistica. April, 1914—Sintomi statistici delle condizioni economiche della Francia: *Mortara* (*Giorgio*). Sull' impiego del coefficiente di correlazione nella semiologia economica: *Mortara* (*Giorgio*). Sopra il punto di monopolio di Cournot relativamente all' ipotesi che il monopolista sia colpito da una imposta progressiva: *Amoroso* (*Luigi*). Ricerche statistiche sui prodotti delle aziende agrarie: *Murenghi* (*Ernesto*).

La Riforma Sociale. April, 1914—Sulle divergenze fra statistiche del movimento commerciale. Part I. Teoria generale delle divergenze fra statistiche commerciali. Part II. Il movimento commerciale del frumento: *Ricci* (*Umberto*). Le forze e i programmi dell' opposizione nell' ultima campagna elettorale politica. I guadagni e le perdite dei partiti nelle elezioni politiche del 1913: *Schiari* (*Alessandro*).

SWEDEN—

Ekonomisk Tidskrift. Haft. 4, 1914—Bankreformen i Förenta Staterna: *Davidson* (*David*).

SWITZERLAND—

Journal de Statistique Suisse. Heft 1, 1914—Die Fluktuation der industriellen Bevölkerung und die Schwankungen im Beschäftigungsgrade: *Lorenz* (*Jakob*). Der Geschäftskreis der schweizerischen Grossaktienbanken, mit besonderer Berücksichtigung der Geschäftsbeziehungen zu Industrie- und Eisenbahnunternehmungen: *Levi* (*Dr. Sigmund*). Sulla Sociologia del Suicidio: *Semini* (*Dr. C.*). Der Rückgang der Viehbestände: *Schmidt* (*Dr. P. H.*). Etude historique sur la statistique de la production et de l'exportation horlogères suisses: *Fallet-Scheurer* (*Marius*). Schweizerische Konjunkturstatistik. Zur Einführung: *Furlan* (*Dr. V.*). Tabellen zur schweizerischen Konjunkturstatistik.

MONTHLY LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since April 8, 1914, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) **Foreign Countries.**

Argentina—

Buenos Aires (*Province*). Elementos para el estudio de la Démografia de la Provincia de Buenos Aires. 51 pp., 8vo. 1913. (The Statistical Bureau.)

Austria—

Die Gewerbegenossenschaften und deren Verbände. Kataster der Gewerbegenossenschaften und deren Verbände in Böhmen. Abteilung 1. Band 6. Halbband 2. 8vo. 1913. (K.K. Handelsministerium.)

Belgium—

Fisheries. Enquête sur la Pèche maritime en Belgique. Part 2. Étude sociale de la pêche maritime. 8vo. 1914. (The Ministry of Industry.)

Labour. Rapport relatif à l'exécution de la loi du 31 Mars 1898 sur les Unions professionnelles pendant 1908-10. 8vo. 1914. (*Id.*)

Cuba—

La Reforma Social. Tomo 1. No. 1. April, 1914. (Issued monthly.) 8vo. Habana, 1914. (The Editor.)

Denmark—

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France—

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SUGGESTIONS *for* RECORDING *the* LIFE HISTORY *and* FAMILY CONNECTIONS *of* EVERY INDIVIDUAL.

By WALTER HAZELL.

[Read before the Royal Statistical Society, May 19, 1914, the President, Professor F. Y. EDGEWORTH, M.A., F.B.A., in the Chair.]

THE work of the Registrar-General for England and Wales and his officers throughout the country is one with which we are all more or less familiar from the outside. His annual report shows the condition of the people as to births, marriages and deaths in wonderful statistical detail. So far as people in the mass are concerned, the information thus given has reached a high degree of efficiency. The diminishing birth and death-rates; the causes of death; the disappearance of certain fatal diseases; and the steady decrease of others, and numberless other data, all give information of the highest importance as to the condition of the people.

When, however, we come to deal with the individual and his life history, and his relation to other members of his family, it appears that our present system is capable of development on cautious lines, which, without in any way disturbing the present methods, would make the records infinitely more useful.

By the courtesy of the Registrar-General, I have been enabled to see something of the internal methods of the General Registry at Somerset House, London, where certified copies are kept of all the records made by registrars throughout England and Wales. The system was established by an Act of Parliament passed in 1836, and coming into operation in June, 1837. In 73½ years to the end of 1910 there have been accumulated at Somerset House an alphabetical index of births, marriages and deaths, containing no less than 120,611,255 names. The full records from which the index is compiled are also permanently preserved.

The system of recording an entry is roughly as follows. The country is mapped out into 11 divisions, and again divided into 635 registration districts, each under a local superintendent registrar. Each district comprises from 1 to 7 or 8 sub-districts. Upon a birth occurring, it is the duty of one of the parents to record the fact within 42 days with the local registrar, for which entry no charge is made. It may incidentally be mentioned that under the Notification of Births Act, the local medical officer of health in localities where this Act has been adopted has to be informed of the birth within 48 hours of its occurrence, but this has nothing to do with the Somerset House system, though it suggests that a double registration of births is going on which might be consolidated. This duplication involves much extra clerical labour and confuses ill-informed people, who sometimes imagine that the first notification is all that is required. The registrar records the child's full name, date and place of birth, the name, address and occupation of the father, and the mother's maiden name, and nothing more. The local registrars retain their original books, but re-write reduced particulars of the birth on sheets, and take two carbon copies of them, sending them to Somerset House, to be followed at the end of the quarter by a certified copy of the full original record, with which the carbon is carefully compared. These carbons are sorted and re-sorted, and sorted again, until they are brought into absolute alphabetical order regardless of locality. They are then typewritten in this order on sheets, each entry merely giving the full name of the child, and the date and place of birth, and the number and page of the volume where full particulars are recorded. These sheets are bound into quarterly volumes, each containing about eight thousand names, and these indexed volumes are open to the inspection of callers. A similar process is gone through with marriages and deaths. If anyone desiring a copy of a certificate of a birth, marriage or death, knows accurately the name, date and place of the occurrence, these certificates are easily found, and a copy is furnished to any applicant at a charge of 3*s*. 7*d*. Many applicants, however, have not sufficient particulars and, therefore, there are daily from 100 to 200 personal searches of these indices by people who desire information, which to them is of the greatest importance, but which is often difficult or impossible to trace, owing to the similarity of names and the want of details. A pathetic side of the case is that a considerable number of women who are about to marry try to trace whether the intended husband has already a wife living. Remembering the great number of common names, the wide area of the country, and also the fact that a marriage is valid even though the parties may have given false names and wrong ages, such marriages may be sometimes untraceable.

The growing personal interest in these records is shown by the fact that whereas in the year 1866 the total searches were 12,135, resulting in 10,017 certificates, for which 1,860*l.* was received in fees, in 1911 75,005 searches produced 56,364 certificates, and an income to the department of 10,875*l.* The searches in 1911, it will be observed, exceeded the certificates by 18,641. How much anxiety, confusion and loss were brought to these thousands of seekers in vain cannot be tabulated, but it must have been serious, and one of the objects of this Paper is to propose a method of lessening this evil.

These records are quite accurate so far as they go, but they might be made infinitely more useful by a simple development which would in no way interfere with the present system, and could be carried out at a small cost compared with the benefits that would accrue. The records lack a connecting link between various members of a family, and even between the several events of an individual life. Each entry stands by itself, and as to all that has gone before or may follow after it, the entry gives no guide as to where any information may be found.

My proposal is that each birth entry should have two distinctive numbers—the number of the registration district, and below it the number of the individual entry. There is no special virtue in two series of numbers especially as the registration districts may later on be merged into the administrative districts. These two numbers should be produced by the person in question through life whenever a record of a birth, marriage or death is made, and on such other occasions as Parliament or custom may from time to time require. It is singular that each birth-registration book as kept by the local registrar contains 500 forms numbered 1 to 500 and yet no use appears to be made of these numbers. All that is needed is that these distinctive numbers should be continued indefinitely, as is done with Bank notes. To help people, "lest "they forget," a brief summary of the birth entry, including the child's number, should be given to the parent when the birth is registered. When the entry reaches Somerset House from the local registrar, a separate Life Card should be made out for each child, giving his full name and number, and the number of his father and mother. As the scheme could not be retrospective, it would be a generation before the parents' numbers appeared on the child's card; but a new generation soon grows up. Also the card must give the reference to the full entry of birth, as is done in the index-volumes above mentioned. When the child becomes an adult and marries, a similar brief reference of his or her marriage will be entered on the card; the only essential detail required beyond the index number being that he, John Smith, had married Mary Jones, number so-and-so. It would be convenient to add the occupation of both partners at the time of marriage, though this fact can be learned by a reference to the original entry. The wife would have an entry on her card that she married a John Smith of such a number. Each of the children would provide one brief entry on the father's card. It need not be on both cards. In the case of illegitimate births, which in 1911 numbered 37,633, the entry would have to be upon the mother's card only. The death or divorce of either party will be duly entered on both cards, and any remarriage on the card of the person affected. The final entry would be the death of the individual and the cause of death. The place of burial might also be added. The card would then be removed to a "dead" receptacle. The cards of both living and dead would, of course, be permanently kept in exact numerical order.

The proposal is very simple, and makes no attempt to emulate the elaborate scheme set forth by Mr. H. G. Wells in his *Modern Utopia*. Simple though it is, it opens the door to many obvious advantages. I will call attention to a few of them.

First, it would tend to raise the life records of men to the level already attained by pedigree animals. This is not sarcasm, as I observe with some shame that we seem to care less for the family history of a man than that of a beast. As one who bred pedigree shorthorns for many years, I write with some small experience of herd books. The ancestry of my animals and their family connections generally could be traced in all directions as far back as the year 1824, giving a pedigree equal in length to, say, 500 years of a human family. The entries are published annually in two volumes, called *Coates's Herd Book*, one for bulls with consecutive numbers, the other for cows and their produce in alphabetical order. The result is that these animals are sold, not only upon their merits as individuals, but upon the position their kindred have held in the shorthorn aristocracy. Reference to another book shows the prizes they have obtained, and the prices they have realised when sold by auction. When animals are sold for exportation, the buyer is furnished with a copy of the pedigree certified by the Shorthorn Society, and this gives the animal a status in the new country, and enables him in certain cases to be entered in the herd book there. So thoroughly is this system worked, that falsifying a record in order to enhance the value of an animal is a punishable offence. All this care in selection for breeding has resulted in a steady improvement of our domestic animals, and a great benefit to the human community. I mention shorthorns merely as an example. There are breed societies issuing stud, herd and flock books for domestic animals of many kinds. Holy Writ says: "How much better is a man than a sheep." In our care for family antecedents we appear to think that a man is of much less concern than a sheep. The owner of pedigree stock, who would not dream of adding to his herd without most careful inquiry as to the character of the family whence the new comer sprang, will approve of his daughter marrying a man who is personally passable, without knowing that he may inherit the tendency to insanity and other transmissible diseases. I am not assuming that marriages can be based chiefly upon the value of inherited characteristics, but at any rate it is possible, if the family history be known, to discourage the marriage of those whose family record is bad, and to encourage the union of people whose ancestry were sound in body, mind and morals. It follows that if the records can be traced for such purposes, they can with equal ease be used for compiling family pedigrees for purely genealogical purposes: an interesting subject which appears to be considered of growing importance, especially in America. The difficulty and litigation about the heirship to intestate estates would disappear, an heir, however distant, being found by turning from card to card until the next-of-kin was disclosed. A minor advantage would accrue by making a legal change of name depend upon an entry upon the Life Card of the person concerned. In this connection it is worth considering whether it would not be wise to make a secret unregistered change of name a punishable offence. No one who makes such a change for reputable reasons would object to making such a record. The Life Card would be an effectual check upon irregular marriages. At present the public notice required before marriages can be solemnized is given in various ways. The most familiar is the publishing of the banns in the parish churches where the respective parties live. For those who are to be married in a Nonconformist church or before a registrar, a notice is put up in the registrar's office for

21 days before the marriage can take place; this notice being visible to any who happen to enter the office. Other methods affect only a small minority. These notices, while needless for the overwhelming majority whose proposed marriages are in order, are no absolute safeguard against the marriage of the intending bigamist, or the immature minors, who wish to wed without their parents' sanction. A technical "residence" and publication of banns in another parish where the parties are unknown is easily arranged. The banns having been published without objection being raised, a clergyman has no power to insist upon the parents' consent to the union of persons who are obviously minors. In the case, however, of a civil marriage before a registrar such consent must be obtained. How many bigamous marriages take place no one can tell, but we do know that a considerable number come to light accompanied by much family misery. As a matter of fact, no one knows certainly that even his closest "bachelor" friend is not already secretly married, and if both the parties to the marriage keep silence, no one need find out the truth. The production of an official copy of the Life Card before a marriage could take place would be a clear safeguard against all such irregularities, and might, if it were thought desirable, render the publication of banns or the notice to the registrar unnecessary.

The accurate conduct of life insurance would be facilitated. At present the would-be insurer answers in writing minute questions as to the cause of death of his parents and near relations. He answers them often accurately, very often wrongly; it may be through ignorance, or with the intent to suppress the truth. It is always difficult, and often impossible, for insurance companies to verify such statements. Under a Life Card system the applicant for insurance would have to state his number. He would then know that the company could, if they thought fit, verify his statements, as to age and family antecedents in all directions as far back as the card system extended, by a reference to Somerset House.

It would be practicable to trace individuals who had been lost to sight for many years. How many deserted wives there are who know not whether they are wives or widows. If the missing man had died in this country, his death would be entered on his Life Card, provided his number were known. Presuming that it had to be called for on various occasions during life, it would probably be ascertainable when his death was registered. Let us assume a very difficult case, and follow out the tracing of a man who had absolutely disappeared for more than a generation. A is involved in a lawsuit about ancient lights. He remembers that a certain clerk, whom he has lost sight of for forty years, would be an invaluable witness (if he could be traced) as to a certain window in the premises in question near which he sat at work. If A had the clerk's life number it would be easy to find his record; but his number is unknown. All A can call to mind after so many years is that the man's name was William Robinson, that he came from Bristol, was then aged about 30, and lived in Holloway, London, with a wife and some small children. Under existing circumstances a search after so many years for an inconspicuous person with such a common name, would be absolutely useless, if no connecting link with old friends remained. But under the Life Card system a search is made, and it begins by examining at Somerset House the alphabetical list of births, which are at present, as already stated, open to public inspection. These lists would then have the birth number attached to each entry. As forty years ago Robinson's age was about 30, his birth must be sought for about seventy years ago, and presumably in Bristol. But Bristol was a large place even then, and several William Robinsons appear as born there about the same time. Reference to their Life Cards show that one died as a child, another married and died in Cardiff childless, others are traced in the same way fruitlessly, until William Robinson is found among the " live " cards, whose card states that he married, had a son and daughter, and that his wife is dead. The daughter's Life Card shows that she was born forty-two years before at 14, Rotunda Road, Holloway, and there being no further entry on her card, she appears to be still living and unmarried. A at once remembers the name of the road, and knows he has found his man. Diligent local enquiry reveals no such name in Rotunda Road or the neighbourhood. The daughter's card gives no light as to her present abode, and the son's card shows that he died unmarried. So far there is no clue, but William Robinson's father's card shows that William had brothers and sisters, whose cards are all among the " dead," save one sister who has recently become a widow. Her husband's card enables an easy reference to the address where he died, which proves to be still her home. The widow being applied to explains that William Robinson is living in a remote part of Devonshire, that his sight is so bad that he reads no newspapers and, therefore, that a fortune spent in advertising would hardly have found him. Robinson appears as a witness in the case, his memory is perfectly clear, his evidence is just what is wanted, and A wins his case. My story of the search for William Robinson was intentionally made complicated, as the point which I wish to emphasize is that any person living in this country could be traced unless he had intentionally cut himself entirely adrift from everyone with whom he was connected, however distantly, by blood or by marriage.

I limited the benefits of the Life Card system to persons living in this country, but it is obvious that by arrangement with the Colonies, or even with foreign countries, the death of persons born here might be reported, and duly entered upon their Life Cards at Somerset House. This would solve many perplexing problems of relations who have disappeared abroad, and may or may not still be living.

The Life Cards would greatly facilitate the study of eugenics. Occasionally attempts at family histories are published, showing the persistence of certain peculiarities in individual families, but such histories, very meagre in scope, are greatly liable to err. The records reporting inherited disease would naturally be suppressed as far as possible. The Life Card would be a permanent truthful witness, whose evidence would be limited only by the amount of information recorded. Supposing no details were entered beyond the particulars now required by law, there would be materials for learning how far large or small families, shorter or longer lives, and death from certain causes, persisted from generation to generation, or in certain localities, or occupations.

Persons when filling up the Census papers would, of course, be obliged to give the Life Card number against each entry. As the Census requires particulars as to blindness, lunacy, and so on, these details might be transferred to the Life Card, thus giving the exact family history as to these afflictions. The "live" cards would be an ever-ready census, because, by counting and examining them, the number and ages of the people could be at any time ascertained. To this total there would need to be added or deducted the difference between the number of emigrants or immigrants from the returns now ascertained of these movements of the population, but such movements might be gathered as to the individual if it were thought desirable. Certain particulars are now required of people taking ocean voyages. These travellers might be called upon to give their Life Card number, and to state their intention of being permanent emigrants, or of returning to this country. This information might be entered on the Life Card, and thus the domicile of the person in question would be settled.

It might be made a condition of naturalisation in this country that the persons obtaining it should start a Life Card for himself and his family.

Many more uses of the system could be suggested, but I do not wish to over-burden the scheme, as it might be developed later on as its usefulness became more apparent. It is obvious that the more complete and detailed the records, the greater encouragement there would be for more searches at Somerset House, for which a moderate though remunerative fee should be charged, which would bring added revenue to the department.

After pointing out the advantages of the Life Card system, it remains only to consider any objections which may be raised on the cost of the system. It would be urged that the person's number when wanted would be forgotten. This would happen in some cases, but it would be found by reference to the birth certificate, which would be kept as at present, with only the addition of the consecutive number. When people found it was to their interest to keep the numbers, few would neglect to do so. There remains the question of cost. In the year 1911, 881,138 births were recorded at Somerset House. Each birth would require its Life Card, even if the child died in infancy. The birth would also be entered on the father's card. The marriages were 274,943. Each would be entered both on the bride and the bridegroom's cards. The divorces were 1,160, and these would be entered on both the husband's and the wife's cards. The last phase would be the entry of the deaths of 527,810 persons, each on his or her own card only, and the transference of the card to the "dead" receptacle. Summing up the yearly clerical work, it would be as follows:—

	881,138	cards to be made out for the births.
	881,138	birth entries on the fathers' cards.
	274,943	marriages on both cards.
	274,943	
	1,160	divorces on both cards.
	1,160	
	527,810	deaths on individuals' cards.
Total	2,842,292	

Thus nearly 3,000,000 cards yearly, or, say, 10,000 every working-day, would have to be taken out of their receptacles, entered and replaced. The entries would be very brief, merely an index to the full record, so as to economize labour and the space required for storage. The cards would be so arranged under registration districts that they would be easily handled. At a very approximate calculation it may be assumed that the cost of the clerical work only would be about 15,000*l.* a year. This is an approximate estimate based upon the employment of clerks at an average salary of 150*l.* a year each, and it exceeds the cost anticipated by a chartered accountant whose advice I sought. Even if this were a net addition to the cost of registration, the benefits would justify the outlay, but it is probable that the Life Card system would economize work in other directions.

I commend this proposal to public attention, in the belief that it will add to the efficiency of life registration, with benefits far in excess of the moderate cost it will involve. Among other advantages it will help every thoughtful individual to feel that his life is linked with the past, as well as with the future of the race, and so will add to his sense of personal responsibility.

DISCUSSION *on* MR. WALTER HAZELL'S PAPER.

SIR TIMOTHY A. COGHLAN, in proposing a vote of thanks to the reader of the Paper, said it was understood that Mr. Hazell did not claim for his proposal strict originality; in fact, his idea was an adaptation of systems existing elsewhere. Mr. Wells, in *Modern Utopia*, advocated a system on a more extensive scale. But he (Sir Timothy) thought Mr. Hazell might have added, as showing the practicability of the system, that it existed to a very full extent at the present time in Belgium. The Belgian system provides for the opening of a register for every child born, and, in addition to recording the names of the parents and the registration numbers of the parents, provides for a record of the movements of the child throughout its life. Each district in Belgium has a distinguishing number, and upon the registration of an infant the registrar of that district gives the infant's number, and the two numbers, that of the infant and that of the district, appear together on the child's card. Upon that foundation the history and movements of the individual were built. Movements from one town to another in Belgium had to be recorded; military service, marriage, &c., were noted, and if any individual on demand failed to produce his card he got into trouble. By the distinguishing number against the names of the parents of any individual his family could be traced, as could be hereditary disease, to a certain extent, by the record of the cause of death entered in the register. Before marriage took place the parties could search for a copy of the card of each other, and thus they might verify the assertions made to them. The system was more elaborate than the proposal made by Mr. Hazell, and he mentioned it in detail to show there was no impracticability at all in carrying out the system proposed. All proposals for amending registration in England were always opposed, on the ground that it was an interference with the liberty of the subject. He must admit that

Mr. Hazell's proposal did involve such interference, because every man must carry his card about with him wherever he went. It was against the instinct of the English people that they should be hampered in the way suggested, and if anything happened that they should be required to produce their card of identity. But the time might come, he said, when even they might feel that, for the advantage of the whole community, it would not be a bad thing to put up with some inconvenience, and that on important occasions in life these cards could be referred to. He thought the idea Mr. Hazell had broached, namely, that the system might be extended to their Colonies, was not at all a bad one. The most lamentable thing that came under his observation in regard to emigration was the enormous amount of desertion that took place. People deliberately emigrated to get rid of their wives and families, and it seemed to him that it would be an excellent thing if an emigrant from this country or any other country going to Australia should be compelled to produce his life card so that they would know all about him. They might be sure that, if a man deserted his wife and family here, he would not mind taking another wife on the other side, and the number of bigamous marriages which probably took place in all the Colonies would astound them if they knew the facts. He gave that as a practical illustration of the use to which the cards could be put. He said he also advocated the system advanced by Mr. Hazell, because it would enable their vital statistics to be advanced very much in utility. He thought the Registrar-General had done a great deal with the material at hand, but if they had more information about themselves the interest attaching to his records could be widened very extensively. Mr. Hazell did not tell them that the proper study of mankind was man, as probably the quotation was very much too trite; but whether it was trite or not, he thought the more they knew about themselves, the more they could connect their individual history with the history of those who had gone before them and of those who came after them, the better it would be for the world at large.

Dr. DUDFIELD, in seconding the vote of thanks, said that before considering the proposals submitted for discussion, he desired to direct the author's attention to one sentence near the beginning of the Paper. The sentence he referred to might imply that the Notification of Births Act was in force throughout England and Wales, whereas, in fact, the Act was an adoptive measure and in force only in those districts where it had been adopted by the sanitary authority or the county council or put in force by Order of the Local Government Board. The universal application of the Act had been recently urged in the daily press, but personally he hoped that the Act would be repealed and not extended in its application. His opinion was founded on the objection mentioned by the author, namely, that it imposed on the public a double duty which could be obviated by an amendment of the Registration of Births and Deaths Act to shorten the period allowed for the registration of births.

That amendment would secure the objects of notification. When he read the Paper he was favourably impressed with the proposals, which appeared to promise a wide field for statistical investigation. There were, however, several difficulties in giving effect to the proposals, and although Sir Timothy Coghlan had told them that the system suggested was in operation in Belgium, he (the speaker) feared that there was little or no prospect of the proposals being adopted in this country. Their adoption would involve the dossier system in vogue on the Continent, a system which he felt sure would never be tolerated here. The facilities which such a system would afford for tracing people who had disappeared would render it highly unpopular with a section of the public. The whole system depended on the adoption of a code number assigned to each child at the registration of its birth and the referring of all subsequent acts of registration touching such child to the card bearing the code number. The individual must therefore have in his possession documentary evidence of his code number. He feared that there was practically no chance of the average individual safeguarding the document referred to and being able to produce it when required. It had to be remembered that in this country demands for evidence of registration were rare as compared with the practice in Switzerland and Germany where the certificate of registration was demanded on entry into school, the army, and on many other occasions. The author had suggested that were the document lost it could be replaced by the individual giving information as to place and date of his birth. It was common experience that many people were decidedly hazy on the latter and even more so about the former. He feared that the only method by which the proposals could be put into effect would be to record the code number, in an indelible manner, on the body of the individual. It was to be presumed that the author's reference to the family histories which would be possible with his system, referred to the "trees" which were commonly constructed to show the inheritance of special characteristics, such as deformities and diseases. Unless very considerable changes were made in the practice of registration the proposed system would be useless for this purpose, as the records would contain information of fatal diseases or accidents only. Even then the information would be incomplete and even misleading, since it was common knowledge that medical practitioners refrained in very many instances from including in the certificates of death all reference to such causes as syphilis, alcohol, cancer and many other diseases. The latter defect would, in all probability, be remedied by making the certification of the cause of death confidential, an amendment of the present practice which had long been urged. To obtain the information necessary to render the proposed system available in settling questions of eugenics in connection with marriage there would need to be a very great extension of the practice of notification, and the information thus obtained would have to be recorded at the General Register Office. At present that Office took no cognisance of notification beyond publishing figures supplied by the Local Government Board and the Medical Officer of Health of the County of London. Supposing the required changes were introduced to get over the difficulties referred to, there would remain the question of expense. The author had submitted certain estimates which he (the speaker) did not feel competent to dispute at the moment. He would, however, say that judging from his own experience (a small one, he admitted) he thought the annual cost had been very much underestimated. The author had not said much about the accommodation required for storage of the cards, but that was a very material question and would have to be very carefully considered if the suggestions were to be brought into practice. There would ultimately be some forty million cards to be stored—stored in such a way as to be readily accessible. He would not venture to picture the size of the building required or the time necessary for journeying to and fro to find and replace cards.

Mr. BERNARD MALLET said he was quite in sympathy with the object of Mr. Hazell's proposals, as he fully realized the defects of our present system of registration. For some months he had been engaged with his colleagues in looking into the various points on which they would like reform, and he had had some interviews with Mr. Hazell. He thought that if they could get what they wanted out of the Local Government Board and the Treasury they might do something to meet Mr. Hazell's wishes, although he went a great deal further than anything they had been able to contemplate. He thought the difficulties of storage—to take one point only—would be very considerable. On their present system of storage they had only room for four or five years, and the question of space was one of the great difficulties. 15,000*l.* a year for merely clerical work sounded a good deal to them. It was an enormous proportional increase on their total expenditure, and they did not find the Treasury generous of expenditure for any statistical purposes. There were other purposes that they would prefer to apply it to before they came to this. Although he could not go so far as Mr. Hazell, he nevertheless sympathized with Mr. Hazell's general idea of co-ordinating the records preserved in his Department.

Mr. SHEPPARD asked how far Mr. Hazell was satisfied as to the possibility of getting people to quote their numbers correctly. His own experience was that it was difficult for some people not merely to quote large numbers correctly from memory but even to transcribe them correctly. If this difficulty could be overcome, and people became reconciled to being numbered, it might then be possible to get the more detailed information as to migrations, &c., by means of which they could determine the distribution of the population at any time. At present this information was only supplied by the census; under the new system the census, except in so far as it provided additional information on such matters as occupation, would be rather in the nature of a periodical check. There would not be the same need of a quinquennial census; a census was in any case a cumbrous process.

Mr. Howard Hazell said, in applying the card system to the prevention of bigamous marriages, if one assumed that there were two John Smiths, both about 30 years of age, one leading a blameless life as a bachelor, and the other leading anything but a blameless life, and one supposed that the latter had deserted his wife and wished to commit a bigamous marriage, it was only necessary for him to refer to the cards to find another John Smith about the same age in order to get a certificate that he had not been married. He would then produce his card proving he was a bachelor, and he would be married; and later on when the first and blameless John Smith wished to marry, he would have considerable difficulty in proving that he had not been previously married.

Mr. A. W. Flux said the point that had been raised by the last speaker was similar to one that occurred to him in the course of the reading of the Paper, namely, that the access to a card register of this kind would be an extremely delicate question, and would have to be handled with much discretion, and hedged about with many conditions and qualifications in part to deal with such a case as had been suggested. In fact, any register of that kind would have to be treated as a record of confidential information, and only persons duly qualified to have access to it should consult it. The kind of information proposed to be put on these cards would be the kind of information which it would be extremely undesirable that all and sundry should have access to without question. How were they to determine whether A or B who applied to examine certain cards was in reality interested in such a way in the matters concerned that his examination was innocent, and that access to that information should properly be granted to him? That was a question that arose in reference to other public records, such as the passenger lists. It was not all and sundry who had access to those lists without question, and quite properly so. He thought a record of this kind would have to be guarded even more than the information on the passenger list. Mr. Hazell, apparently, was not aware that, for two years past, passengers leaving this country have been asked to declare whether it was their intention to emigrate or to come back to an established residence in this country, and the accuracy of the information supplied on that head would be a point of peculiar importance if it were to form part of a permanent record for later investigation on which acts of very considerable importance might turn. If a system of card registration would tend towards greater accuracy in records of that kind, it would be welcome; but it would encounter some of the difficulties that were at present encountered in the matter of accuracy of these particulars. The proposition did not strike him as novel. It came back with a savour of what he could remember being talked about by Professor Marshall 25 years ago when the desirability of such personal records and the difficulty of establishing them had been discussed. So long as the relations between public authorities such as the police and the people were not those of that mutual intimate confidence which would exist in an ideal state. the difficulties were very considerable. The trouble, in fact, of establishing a card register of this kind was that the people would not have it. They objected to having particulars about their personal history placed on record unless they were surrounded with even a taller hedge of official secrecy than he had previously suggested. That was the sum and substance of the principal thought that remained with him after going through the Paper; that if the thing were to be done, the records must be kept secret to a degree which would very seriously qualify the beneficial use of them that had been dwelt upon so largely by Mr. Hazell. He was inclined to agree with Dr. Dudfield that 15,000*l.* a year would be considerably short of what would be necessary to meet the total expenditure which would be requisite in handling such a mass of material.

Mr. DE JASTRZEBSKI, speaking as one who spent practically the whole of his official life in the work of registration, said that Mr. Hazell had laid his finger at once on the great blot of their system, viz., that an entry of death or birth was in the main a thing entirely apart, and pointed neither backward nor forward as it should do. It was an essential of a really sound entry recording one of the vital facts of life that it should enable them to give the next step in the life history. If they could do that, they had already accomplished much. That could be secured, of course, by an apparatus far less costly and far less complicated than the system of cards which had been put before them. The objections to that system had been very ably pointed out, and he need not emphasize them; but he reminded the last speaker that there was no need in an ideal state for mutual confidence between the police and the public because there would be no police. Dr. Dudfield had referred to the Notification of Births Act, which only applied to about 60 per cent. of the present population of the country. He agreed with what Mr. Hazell said, that it would be a most desirable reform if that duplication of notification and registration could be done away with. What one should have was a sufficiently early registration of birth to do away with the need of notification. In the original proposals for establishing civil registration in 1836 (and in the Bill of 1834, drafted by Brougham), which failed to pass the House of Lords, three days was the period in which registration had to be effected, or at any rate notification for registration had to be given. Registration within three days would do away with any necessity for the Notification of Births Act, and he for one would strongly deprecate the compulsory extension of the Notification of Births Act, because it would interfere with a much more desirable reform, namely, speeding up the registration of births. With regard to divorce, although they in the General Register Office knew a certain number of people were divorced every year, there was no provision whatever for recording what people had been divorced, and they had no official knowledge that a marriage had been dissolved. The record remained permanently untouched without note of any kind. The Registrar-General had no power whatever to record that a marriage had been dissolved or set aside. They would not therefore be able to supply the particulars on the card which Mr. Hazell thought would be desirable. Mr. Hazell suggested it would tend to raise the life level of men to that of pedigree animals. He (the speaker) did not know how they would find out whether there was a transmissible disease or insanity. It would not appear on the card unless the person died from general paralysis of the insane or something of that sort. Outside that they would not know from what the individual had suffered, and he was altogether at a loss to see how it would encourage the union of people whose ancestry was sound in mind, body and morals. If they were going to confine marriage to persons who could show a blameless ancestry in body, mind and morals, then the Registrar-General and he were fortunate in their day and generation, because that would reduce the marriage rate to nil. The marriage law of this country offered every facility for clandestinity and put every obstacle, in the shape of pettifogging restrictions, in the way of people who wanted to be married. Mr. Hazell was wrong when he said they could be married only in two ways; there were in fact five. They could obtain a special licence from the Primate without any restrictions, moral or otherwise, which would enable them to be married at any place and at any time without any further formality, or they could obtain a Surrogate's or Superintendent Registrar's licence, which only involved the declaration that there was an absence of legal impediment and that one party had resided fifteen days in the diocese in question. There was no absolute safeguard. On the contrary, in England they went out of their way to allow a bigamist to get married as often as he pleased without any publicity whatever. If by a system of compulsory dossier they could ensure a safeguard there would be a great deal to be said for it, but the production would not give perfection. He could say he was John Smith and he could get John Smith's dossier and marry in that name, and one month later he could get a dossier for John Jones. It would not give any real security. The security they had at present consisted of the bona fides of the parties, and under this system it would equally consist of the bona fides of the parties. The person who wanted to evade the dossier system would evade it.

Mr. Rew said the Paper was one of the most interesting that the Society had had before it for some time. It certainly opened up new ground and had given rise to a most interesting discussion. Attractive as Mr. Hazell's proposal was from many points of view, what struck one more particularly in listening to the Paper and the discussion were the difficulties that arose in carrying it out. Personally he did not think if the thing was worth doing the question of cost should be greatly considered. The question was—was it sufficiently important from a national point of view for those in authority to take action? But what were the precise objects to be secured by the institution of such a system? Mr. Hazell started with an attractive analogy from Shorthorn breeding. The

Shorthorns had a very long and most distinguished ancestry in the animal world, and their pedigree could usually be traced back to the great "Hubback," the father of the breed; but even these pedigrees, carefully as they were kept, were not always exact at every stage. It might be that in one generation the nineteenth Duchess was put down whereas in fact it was the eighteenth Duchess. That did not really matter to the purchaser or to the animal itself, but it would be of considerable importance in the record of a human being if the wrong lady's number was put on a man's card; and however carefully they conducted their operations one must make allowances for human fallibility. It was difficult for him to imagine how the thing would work without compelling every person to keep a card, or as one of the speakers suggested without an indelible mark on the body of every person born into the world. It was conceivable it might be worked, assuming that the possibility of error of description or error of transmission of the numbers could be eliminated. It might be said that, although such a carrying about of a record of his life by the individual was exceedingly unlikely to appeal at the present time to the average Englishman, yet they might gradually educate him to that point; and he was rather surprised that no reference had been made in the discussion to the first step which had been taken in that direction under the National Insurance Act. A very considerable number of people were now getting accustomed to keep a card, though the inducement would not be altogether as great in the case of a card which recorded their birth number. He thanked Mr. Hazell for introducing to the Society a subject which he thought was well worth serious discussion, and might in time, in some form or another, have practical results.

Dr. M. GREENWOOD said that the question of the accuracy of death certificates was an important one in this connection. So long as death certificates were not confidential communications made by the certifying practitioners to the registration authority they must tend to be incomplete. There was a clear motive for a medical man earning his living in practice to refrain from introducing particulars which might be painful or offensive to surviving relatives, if he could honourably do so. As a matter of fact, it was frequently possible, without any violation of truth, to confine oneself to the statement that the immediate cause of death was such and such a condition, and not to pass beyond this proximate cause, although, from the scientific point of view, inferences as to remoter causes might be desirable. It seemed to him (the speaker) that medical information likely to be of value in constructing pedigrees, or in deciding as to the expediency of marriage in any case, was never to be expected if relatives and other interested members of the public had access to the cards of Mr. Hazell's system. On the other hand, it was easy to see the apparent hardship of refusing relatives access to information respecting members of their families. The difficulties of this question might seem trivial to the general public, but in reality they were very great, and would have to be considered very seriously before Mr. Hazell's scheme could be brought within the field of practice.

Mr. YULE said the Paper was an exceedingly interesting one, but he agreed with previous speakers in thinking that if the system suggested were to be made of practical effect as regards not merely searches for records of births, deaths and marriages, but as regards, for example, eugenic marriages, it would have to be made so much more complicated and complete that there would be very grave objections against it from many points of view. If the record were to be of service on the question of marriage, the card required would have to cover not only the cause of death but also certain diseases and defects. Mr. Hazell had suggested that the record of defects should be taken from the census record. Already these census records of defects were in the highest degree untrustworthy, and would tend to become more so if published individually; but it would surely be a gross breach of the present law if the records of these defects and census schedules were entered on cards available for the inspection of the public. If, on the other hand, more trustworthy, non-censal returns were required as to such defects, he asked how such returns were to be obtained. There was further the very grave question that was raised by Mr. Flux, namely, if by some means a more or less complete record of defects and diseases were obtained, were the cards to be opened for the inspection of everybody who chose to ask? If so, it opened somewhat unpleasant possibilities. If not, but if, for example, the cards were to be open to the inspection of people who intended to marry, what was to be the evidence of the intention to marry? The possibility of inspection after betrothal would be rather late, unless the law of breach of promise of marriage were altered, so that, say, insanity of the fiancée's grandfather was a defence to an action for breach. If such an alteration of the law were not made, Mr. Smith would have to come and say he thought of proposing to Mary Jones, and might he search her card? and Miss Jones would have to come along at a rather early stage of the walking out and say she thought that Mr. Smith was likely to propose within the next few weeks, and might she search his card? Were they going to get evidence by this process? The scheme was very interesting, but certainly afforded many opportunities of abuse and many difficulties in the way of getting a sufficiently trustworthy record to be of service. With regard to the cost, the number of entries as regards deaths to be entered in a year might be greater than stated on p. 713. Were there not two entries to be made in the case of married people: that is, the death of the wife on the two cards, or was it only intended to enter it on the man's card?

Mr. HAZELL, in reply, said he admitted that the Paper in various ways was crude, and he thanked those who had called attention to oversights. He happened to live in a district where the Notification of Births Act was adopted, and he had overlooked the fact that it was only an optional Act at present. He was aware that there were other methods of giving notice of marriage besides the two to which he had referred, but he thought that the number of persons who pay 30*l.* for a special licence was very small indeed, and that he was correct in saying that the overwhelming majority of people gave notice of marriage in one of the two ways mentioned. Sir Timothy Coghlan had referred to the great advantages that would accrue by the system, especially in relation to the tracing of husbands who had deserted their wives, either in the Colonies or at home. All who had any acquaintance with emigration work knew how many deserted wives there were. The number of people who would object to being traced was surely a small minority, and the State could not adapt its arrangements to please a very small percentage who were either crotchety or irregular in their lives and wanted to be lost sight of. The Registrar-General's report, as they all knew, gave most minute and valuable statistics as to the causes of death. Even a layman like himself knew that during a long period of years the number of deaths from cancer had increased. If, as one speaker had stated, deaths from cancer were often certified under some other name it made the Registrar-General's report on this important question of no effect. He could see the difficulty from the doctor's point of view, but he thought that could be surmounted by a confidential notification not open to the public. In regard to Mr. Howard Hazell's point, that a John Smith who intended bigamy might fraudulently produce the record of an innocent John Smith who was a bachelor, it would appear that such a fraud could not be easily perpetrated. The innocent John Smith's card would have to agree in so many particulars with the guilty one's that it was very unlikely that such a misuse of the card would pass through. Though in theory this might be done, in practice he thought it would scarcely ever occur. He believed that the number of persons who would object to their records at Somerset House being focused on to a card would be very small, as all his proposal was that the information now scattered about on individual entries at Somerset House should be accumulated to make reference easy. Parliament might or might not later on prescribe the addition of certain information, but this did not affect the immediate question. Whether the birth was to be registered on the mother's or the father's card was a question of detail and not of principle. It would be more convenient to put it on both, but as each card was connected with other cards the reference from the wife's to the husband's record would be easy. If William Robinson's sister was dead or could not be traced, still William Robinson had other relations who could be found out by reference to their respective cards. In spite of all that had been said in kindly criticism he thought the idea would take root sooner or later. He was very glad indeed that the Registrar-General had given the proposal his blessing, but with proper official caution.

The following Candidates were elected Fellows of the Society:—

H. Bellman.
H. J. Grisewood.
D. T. Jones.

ON THE USE OF ANALYTICAL GEOMETRY TO REPRESENT CERTAIN KINDS OF STATISTICS.

By Professor F. Y. EDGEWORTH, M.A., F.B.A.

(*Continuation.*)

SECTION II.—THE METHOD OF PERCENTILES.

THE Method which is next to be considered has in one respect the advantage over that which we have placed first. It is able to deal with rough imperfect data. The data proper to the method of moments are (a multitude of) single observations. The observations consist each of an integer number in the leading case typified by games of chance; for instance, the number of balls of a certain colour in a sample drawn at random from a bag containing balls of two or more colours (perfectly mixed). Observations relating to continuous quantity, space or time, seem to belong to a different type; but they may be, and for the purposes of Probabilities, I think, should be, reduced to the primary type. Measurements made as accurately as possible may be considered as integer numbers of units or degrees each as small as may be.* In practice, no doubt, we have to put up with much less perfect data. For instance, measurements of human statures are often given in (integer) inches; though, of course, the things measured do not vary thus *per saltum*. But though we have to accept such statistics, we regard their failure to realise the ideal type as an imperfection; we seek to rectify it as far as possible by adjustments and corrections such as Mr. Sheppard has applied. Contrariwise, the data proper to the method of *percentiles* are not single observations, not minimum strips of area bounded by the frequency-curve and two ordinates as close as may be, but integral blocks of area bounded by ordinates at a finite distance from each other. For example, the anthropometric measurements given by Baxter† in units of *two inches,* which are ill suited to the Method of Moments, are well suited to the Method of Percentiles. No doubt it is desirable that the blocks of area demarcated by percentiles should be as small as possible, the number of percentiles being as large as possible consistent with the validity of the method. But it will appear in the sequel that the number of percentiles utilised cannot be large *in relation to the total number of observations* consistently with the validity of the method. Where the number of observations is very large, over 300,000 in the last example cited, this restriction on the number of percentiles employed is not serious. But we have often to be content with a much smaller number of (perfectly independent) observations. In general there is a limit below which nothing is gained by increasing the number of percentiles and diminishing the size of the parcels into which they distribute the given total. Or rather, this much only is gained by the possession of further data, that by being able to break up the parcels into their constituent items we may be able to redistribute the items into a new set of parcels more favourable* than the one first coming to hand for the evaluation of the required constants. Still, the number of parcels on which we operate must be small in relation to the total, and may be small absolutely. The number may be as small as *five* even in the general case where there are *four* constants to be determined. If one of the constants is given—for instance, $\kappa = 0$, the group being evidently symmetrical—*four* percentiles only will be necessary. The efficacy of the method to deal with a few comprehensive data might be likened to the power exhibited by the historian when he draws just inferences from a few broad facts, making the most of the little evidence available. But, to complete the parallel, a writer thus gifted may be so wanting in other qualifications that he would not make much use of additional materials supposing that they became accessible. It is natural to presume that where a larger amount of information is intelligently utilised a more accurate result will be attained. The presumption, however, is not universally true. Genius may reconstruct some features of the past more faithfully from imperfect information than mediocrity exhaustively handling more abundant materials. Similarly, in the constructions with which we are concerned, it is possible that the worse materials may yield the better result. For the Method of Moments dealing with the more perfect materials deals with them in a way which, though good, is not the best possible, not being that which is prescribed by Inverse Probability.† Whereas the Method of Moments does employ Inverse Probability, and so makes the best use of its bad materials. However, the Method of Percentiles is not here put forward as superseding, but only as supplementing, the Method of Moments. In general, the method of moments is to be preferred; but the Method of Percentiles should be substituted when the data are too rough for the more refined method.

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* Cp. "Law of Error," *Cambridge Philosophical Transactions,* 1905, Appendix I.

† Medical Statistics (United States War Department), cited in my "Methods of Statistics," *Jubilee Volume of the Journal of the Royal Statistical Society* (1885), p. 195, as presenting a slightly inaccurate value of the *modulus.*

The new method may be introduced by describing it as a development of the procedure employed by Galton for determining the constants of a normal group, the centre and the "spread" or coefficient of dispersion (probable error, standard deviation or modulus). Galton had been preceded by Quetelet; and with reference to the use of the Median (to determine the centre of the group) by Laplace.

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* See below, p. 743.

† Cp. *ante*, p. 304.

Laplace, in his so-called *Method of Situation*, had not only employed the Median to determine the sought central point, but also calculated the error to which this determination is liable.* Laplace's method of determining the error incident to the use of the Median has been extended to other percentiles.† From a determination of the error incident to the use of a percentile it might seem a short step to the error incident to the ascertainment of the constant of dispersion according to the practice of Galton and Quetelet. Thus, suppose that the quartiles having been observed, the *modulus* is ascertained by equating it to half the distance between the quartiles divided by the constant ·4769. . . . The modulus multiplied by twice this constant is equal to the difference between the abscissæ of the two quartiles; and thus the error of the modulus depends entirely on the errors of the *quartiles*. But in estimating the joint effect of those errors there occurs the difficulty that they are not *independent*. This difficulty has been overcome by Dr. Sheppard, who has given an expression for the error incident to the determination of the *Standard Deviation* from any number of percentiles.‡ By minimising this expression, and the corresponding expression for the error of the centre as determined by percentiles, Dr. Sheppard obtains formulæ for the use of percentiles with maximum accuracy.§ Well, the problem here attacked may be regarded as an extension of that which Dr. Sheppard has solved. The given group which he contemplates may be considered as *translated* according to our conception from a normal error-curve. His constant "a" is what our constant "a" becomes when our constants κ and λ are zero.

A fuller explanation of the method may begin with the generally accepted hypothesis that a given frequency-group may be regarded as a sample taken from an indefinitely large group obtained by repeating observations under exactly similar conditions. This, as I understand, is the conception which is entertained by Professor Pearson when he speaks of "the fit of an observed to a theoretical frequency-"distribution"‖: a theoretical distribution which may indeed be treated as "known *a priori*"; but "in a great many cases has "to be judged from the sample itself." This is the conception of a limit applying to any frequency-constant which I have elsewhere adduced¶ referring to the authority of Dr. Venn and Dr. Sheppard. The conception might be illustrated by an area subdivided into compartments in a plane on which raindrops are supposed to fall sporadically. After a long continued rain the fall on each constituent compartment would be practically proportioned to its extent. But a slight shower, a mere sprinkling, would result only in an approximation to the distribution which would hold good in the long run. Thus, in Fig. 10, let the area enclosed between the abscissa and the curve (not shown) be unity: and let this area be broken up by five ordinates into six compartments of which the contents are specified. (They are proportioned to the number of observations between contiguous percentiles in a concrete example adduced below.) In the long run each section will receive a number of drops proportioned to its area. To contemplate the effects of a slight, or, more generally, a finite shower, let us substitute items which, unlike drops of water, continue separate and separable after having fallen, say grains of sand. Suppose sand-storms to have raged so chaotically that grains of sand are deposited with sporadic fairness on the areas enclosed between the curve and the abscissa. Of ten thousand grains we may expect that some 668 will be in the compartment furthest to the right, about 919 grains in the next compartment, and so on. The distribution of the ten thousand grains will be very nearly, but not in general, exactly this. If beginning from the extreme right we count 668 grains and draw an ordinate just to the left of the 668th grain, the apparent percentile thus presented will not usually coincide with the true percentile which is at the point 1·5375 measured from 0 or $m + 1\cdot5375$ if m is the abscissa of 0 (with reference to an origin on the left). If the apparent percentile lies to the *right* of the true one then there will have occurred an error in the distribution of frequency measured by the little strip of area which is contained between the ordinate erected at the true percentile (the point $m + 1\cdot5375$) and the ordinate (not shown) erected at the apparent percentile (the other boundaries of the strip being the frequency-curve—not shown in the figure—which represents the ideal distribution, and the interval in the abscissa between the true and apparent percentile). The compartment on the left of the true ordinate will be depleted to the extent of that strip: the compartment to the right augmented. The strip of area constituting this excess or defect is regarded as an *error*—say E_r pertaining to any the rth compartment—in relation to the ideal or hypothetically true distribution of N particles among the several compartments.

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* *Théorie Analytique des Probabilités*, supplement ii, and liv. ii, ch. iv, art. 23; *Mecanique Celeste*, liv. iii, art. 39, 40.

† By the present writer, *Philosophical Magazine*, 1886, vol. xxii, p. 375.

‡ *Transactions of the Royal Society*, 1898, vol. cxcii, A., p. 114, *et seq.*

§ "Maximum" rather than "greatest possible" if the views which I express below, p. 743, are correct.

‖ *Philosophical Magazine*, vol. L (1900), pp. 160, 164.

¶ *Encyclopædia Britannica*, eleventh edition. Article on "Probabilities," § 122.

Upon some such fundamental hypothesis of a true distribution rests a construction which at successive heights involves the following three problems. *Firstly*, supposing that the ideal frequency-distribution being of the general character defined, a sample numbering N is taken at random—N grains fall sporadically on an area ruled in the manner described: what is the probability that there will occur the system of errors E_1, E_2, &c., in the areas of the respective compartment, the error E_r being the difference between the proportionate number of occupants which there would be in the rth stall if the number N was indefinitely large, say U_r, and the proportion which is actually presented, N being finite, viz., $U_r - E_r$? *Secondly*, supposing that the given distribution is the result of taking a sample N from an ideal distribution consisting of a *translated* error-curve with given constants m (for the position of the Median) and a, k, l (for the coefficients of the operator): what is the probability that there should occur an assigned set of percentiles, or, in other words, an assigned set of errors in the observed percentiles—the error of a percentile being the difference between its observed or apparent position, say x_r, and its true position, x_r'? *Thirdly*, supposing that the observed frequency-distribution has resulted from a sample of an ideal distribution consisting of a translated error-curve which is characterised by a certain system of values for the four constants m, a, k, l: what is that system of constants from which the observed distribution has most probably resulted—or which may best be put for the true system?

1. The first problem is an extension of the simplest problem in Probabilities: viz., if N balls are taken at random from an indefinitely large mixture of balls of two different colours, what is the probability of any assigned distribution of colours in the sample? We have merely to substitute for *two* colours *several* colours. Considering the number and complexity of the problems relating to games of chance which have been solved by the classical writers on Probabilities, it is remarkable that, as far as I know, they have not given a solution adapted to practice of this problem. Dr. Sheppard appears to have been the first to give the required solution: in his masterly article on the Normal Law of Error in the Transactions of the Royal Society for 1898. Professor Pearson, in the *Philosophical Magazine* for July, 1900, has given the solution in a very convenient form; which, according to my interpretation and notation, may thus be stated. When there are only two colours occurring with respective probabilities U and V ($U + V = 1$); the probability of a deviation $+ E_1$, in the proportion of balls of the first colour from the ideal proportion U, and accordingly a deviation $E_2 = - E_1$ in the proportion of balls of the second colour is proportionate to

$$Exp - \tfrac{1}{2} N \left[\frac{E_1^2}{U} + \frac{E_2^2}{V}\right].$$

This expression is easily identified with the more familiar expression of the probability as an ordinate of a normal error-curve, of which the modulus is $\sqrt{2UV/N}$, the ordinate at the point distant E_1 from the centre. When there are many colours with probabilities (of being drawn) U, V, W . . . the probability of an assigned set of errors in the proportions of a sample numbering N, namely, the errors E_1, E_2, E_3 . . . is proportionate to

$$Exp - \tfrac{1}{2} N \left[\frac{E_1^2}{U} + \frac{E_2^2}{V} + \frac{E_3^2}{W} + \ldots\right].$$

The formula given by Professor Pearson, especially when it is approached as I have attempted to approach it[*] through the familiar example of differently coloured balls, carries attention to the important incident that, as in the case of two colours or classes, so in the more general case, the reasoning by which the approximate formula is established requires that none of the probabilities U, V, W . . . should be very small; that the product of the said probability and N should be large. In order that terms neglected should not be relatively large, it is requisite that $\frac{1}{\sqrt{\text{NU}}}, \frac{1}{\sqrt{\text{NV}}}$, &c., should be small fractions whose third and higher powers may be neglected. Accordingly, in employing our method, it boots not to use percentiles which demarcate portions of area so small that $1/\sqrt{\text{NU}}$ is a large fraction. Now if n is the (ideal) number of observations in any compartment $\text{U} = n/\text{N}$; and $\text{NU} = n$. Accordingly $1/\sqrt{n}$ must be a small fraction, say at most one-fifth or one-fourth; n must be at least about 20.[†] Thus, if we are given only 400 observations, we could hardly employ with advantage, I should think, more than *twenty* percentiles. Perhaps *ten* would give as good a result.

2. In general, according to a theorem of Laplace to which allusion has been made, we pass from an error in *area* of the type E_r to an error in (the position of) a percentile of the type $(x_r' - x)$ by equating E_r to the *algebraic* sum of two errors of the type $(x_r - x_r')\text{Y}_r$, $(x_{r+1} - x'_{r+2})\text{Y}_{r-1}$, where Y_r is the ordinate of the ideal frequency-curve at the point x_r (the errors being supposed small). In the particular case when the ideal frequency-group consists of a translated error-curve with given constants m, a, k, l, we have to express $(x_r' - x_r)$ and Y in terms of those constants. Now $x_r - x_r' = x_r - (m + \text{X}_r)$, where X is the abscissa of a point on the constructed curve relatively to the (true) median, and accordingly $\text{X} = a\xi_r + k\xi_r^2 + l\xi_r^3$; ξ_r being an abscissa of an error-curve with unit constant of dispersion. Also Y_r, the ordinate of the constructed curve, is equal to η_r the corresponding ordinate for the generating error-curve, divided by X_r', the differential coefficient of X_r, with respect to ξ_r. Thus (if, as usual, we put Δ prefixed to any function, *e.g.*, $(f(x)$, to designate $f(x + 1) - f(x))$, it is proper to replace E_r in our first problem by the expression

$$\left[\Delta \frac{(x_r - x_r')\eta_r}{\text{X}_r'}\right].$$

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[*] Congress Paper, sect. III.

[†] A similar reservation is required in the use of the Pearsonian criterion as I have noticed with reference to Dr. Greenwood's paper in the *Journal of the Royal Statistical Society*, 1914, vol. lxxvii, p. 198. But I have some hesitation about imposing a restriction which has not been observed by Professor Pearson and his followers. The rule that compartments with much less than twenty observations should not be utilised would materially alter the received verdicts of the Pearsonian criterion in certain cases; for instance, in the second and fifth examples given by Professor Pearson in his pathbreaking paper in the *Philosophical Magazine* for July, 1900.

Minus the sum of squares of expressions of this type, each multiplied by $\frac{1}{2}$N and divided by U_r, say $-$ NT, forms the logarithm of the expression which multiplied by a proper constant represents the probability that the assigned system of percentiles should be presented by a sample numbering N taken from the given true frequency-distribution. For example, let the constants of the given distribution be $m = 0$ $a = 1$, $k = 0$, $l = 0$. In short, let the ideal distribution be a normal error-curve with the origin at the centre and with constant of dispersion, for which we shall here take the *standard-deviation*, equal to unity. Then the probability that a sample of 100 observations should present a distribution such as that represented in Fig. 13 would be, as calculated in a later page, proportional to $Exp - 100 \times \cdot 003$; or rather twice the integral of the error-curve.

$$\frac{1}{\sqrt{\pi}} e^{-\frac{1}{2}x^2} \text{ from } x = \infty \text{ to } x = \sqrt{\cdot 3}$$

gives the measure of the improbability attaching to the assigned occurrence—that is not a very great improbability. If the number of independent observations were 1,000 the improbability would be considerable, the odds against the event being less than 3 to 1,000.

3. It is a short step by way of Inversion from the probability that (an ideal frequency-distribution with) a given system of frequency-constants may produce an assigned set of percentiles to the probability that a given set of percentiles may have been produced by a certain assigned system of frequency-constants. Having obtained the expression for that probability for any assigned system of frequency-constants, we are in a position to determine according to principles set forth in a former Paper* that system of frequency-constants from which the observed set of percentiles most probably resulted, or which may best be taken for the true system of frequency-constants†. This system of values is given by equating to zero the differential coefficients of T with respect to each of the four coefficients m, a, k, and t, provided that the second term of development fulfils the condition of a maximum (for $-$ T). The student of our former Paper will remember that the powerful instrument of Inverse Probability at one stroke not only elicits the most probable values of the *quæsita*, but also the probable error to which that determination is liable.

Built with the instruments, and resting on the foundation which has been described, the edifice which we are constructing presents as it were two wings: a diversity of construction according as the subject-matter consists of slightly abnormal, or considerably abnormal, frequency-groups. I suggest this *dichotomy* as appropriate to the present topic rather than the *trichotomy* employed in the first section. And I am disposed here to draw the line which demarcates the first class nearer to the limit of perfect normality than in the first section: to define the "slightly abnormal" cases by the retention of the *first* powers only—not the first and second powers—of the variables κ and λ[*] which indicate divergence from normality.

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* *Journal of the Royal Statistical Society*, 1908, vol. lxxi, p. 388, *et seq.*

† Cf. *loc. cit.*, p. 386.

SUB-SECTION I.—SLIGHTLY ABNORMAL CURVES.

By the definition of this class two of the variables, κ and λ, which enter into the expression T which is to be minimised, are small. But we do not enjoy the full advantage of dealing with small quantities as long as the two other variables a and m may be large. Now a may have any value. For a is a number, a *numeric* as some now say, which—multiplied by unity—gives the measure of what may be called the *quasi-modulus* of the constructed curve: what would be the modulus if the group were not only nearly, but perfectly, normal (for "modulus" here, as in other passages of this Paper, "standard-deviation" may be read *mutatis mutandis*)? And m—the abscissa of the Median—may well be larger than a. It may with great propriety be twice or three times as large as a, so as to secure that the origin from which the position of the percentiles is measured should lie entirely outside (the sensible portion of) the curve. I propose to remove these two impediments to the use of small quantities, as follows.

First, I take as the origin a point which may be described as the apparent Median adjusted. No adjustment is required to find the position of the apparent mean when the observations are given in detail, in the neighbourhood at least of the Median. We have merely, as explained above, to take on the abscissa a point on one side of which there are as many observations as on the other. But very generally the observations are not, and indeed cannot be, given in the required detail. There is given only the number of observations in a central compartment: for instance, in an example presently to be adduced, it is given that between 299·5-tenths of an inch and 300·5 there occur 329·5 observations of barometric height; the number of observations outside the compartment being such as to make it evident that the Median was between the points 299·5 and 300·5. The general practice which I propose may conveniently be introduced by applying it to this particular example. A first adjustment is the familiar practice of simple proportion. Whereas there are 1,380·5 observations *below*, that is in the arrangement adopted to the *right* of the point 299·5, and the total number of observations is 2,922, it follows that there must be 80·5 observations between 299·5 and the Median. Now there are 329·5 observations in the compartment between 299·5 and 300·5. Accordingly, *if the observations lie evenly* between those limits, if the frequency-curve be treated as in that neighbourhood a horizontal line, the Median may be taken to be at the point which divides the distance between those limits, namely, unity, in the ratio 80·5 : (329·5 — 80·5). The Median thus calculated proves to be 299·744. It is to be remarked that the condition italicised, though in general, with respect to other percentiles, not safely to be assumed, may be assumed with a minimum of inaccuracy when the ***Median*** is to be determined. For the normal frequency-curve is approximately horizontal in the neighbourhood of its centre; and the curve which is now to be constructed is approximately normal. Simple proportion then appears to be safe enough. But I propose to improve upon it by utilising the condition that the curve under consideration is translated from a normal curve. Suppose that the true Median is at a point O between 299·5 and 300·5; and let the sought distance from O to 299·5 be x_1; the distance from O to 300·5 being x_{-1} $(= 1 - x_1)$. Now $x_1 = a(\xi_1 + \kappa\xi_1^2 + \lambda\xi_1^3)$ where ξ_1 is the abscissa for the generating unit normal curve corresponding to the abscissa x_1, for the generated curve; and x_r is similarly related to ξ_{-1}. Now κ and λ are by definition small; and ξ_1, ξ_{-1}, if the central compartment is fairly small, are small; and therefore their second and third powers are *very* small. Therefore x_1 and x_{-1} and approximately proportioned to ξ_1 and ξ_{-1}. But ξ_1 and ξ_2 are the abscissæ of the error-curve with unit constant corresponding to the integrals (in Dr. Sheppard's notation) $\alpha = {}$·0551 $\alpha = {}$·1704; integrals obtained by dividing 80·5 (the number of observations between the Median and 2995) and 249 (the number of observations between the Median and 300·5) by 1461 (half the total number of observations) respectively. These abscissæ are easily determined with the aid of well-known tables, with particular facility by the use of the table which Mr. Sheppard has constructed giving the value of ξ (in our notation) corresponding to each assigned value of the (double) integral (his "α"). Thus, corresponding to the area or integral $\alpha = {}$·0551, the table shows ξ_1 to be ·0691. Similarly, ξ_{-1} is found to be ·2152. Dividing the interval between 299·5 and 300·5 in the ratio $\xi_1 : \xi_{-1}$ we obtain for ξ_1 ·244; and accordingly for the position of the Median 299·743, nearly identical with the value obtained by simple proportion, viz., 299·744.*

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[*] Those who have read the first section will not need to be reminded that $\kappa = k/a$, $\lambda = l/a$.

I propose to take the apparent Median thus adjusted as the true Median, at least for a first approximation. For a second approximation, when we take into account *second* powers of κ and λ, it will be shown how to re-introduce the variable m as a correction of the adjusted Median. Meanwhile, we shall take the adjusted Median as the origin, measuring from it the observed percentiles; the points x_1, x_2 . . . x_r and $-x_1$. x_{-2} . . . x_{-r} given by observation such that the number of observations observed to occur between (ordinates drawn through) x_r and x_{r+1} is NU_r. The adjusted Median will thus form as it were the central column of our construction; it will play the same part as the Arithmetic Mean (the Centre of Gravity) in the Method of Moments. Let it not be hastily assumed that the Method of Percentiles is at a very great disadvantage in having to depend on the observed Median. For even with respect to the normal error-curve and frequency-curves in its neighbourhood the accuracy of the Median is not so very much less than that of the Arithmetic Mean. Theoretically, the probable error of the Median, in the case of a normal group, is only some 25 per cent. above that to which the Arithmetic Mean is liable. Now I hold with him who teaches that a difference of 25 per cent. or so in probable error is not a practically very significant difference.* Besides, we are not exclusively concerned in this Paper with frequency-curves which are in the neighbourhood of the normal error-curve. For the approximation effected in Subsection II with respect to the curves of considerable abnormality the Median as here obtained will be employed. But for frequency-curves considerably divergent from the normal in the direction of *lepto-kurtosis*, to use Professor Pearson's terminology, the probable error of the Median is *less* than that of the Arithmetic Mean. True, it is greater in the case of divergence in the opposite direction *platy-kurtosis*. But the two cases are not equally probable. For, as shown in our first section, the frequency-curve may well diverge to *any* extent in the former direction; but it can not, while preserving appearances, diverge very far in the latter direction. For example, in the case of symmetrical frequency-curves, the utmost permissible degree of *platy-kurtosis* is the limiting form shown in Fig. 9A, the rectangle. But the probable error of the Median in that extreme case exceeds that of the Arithmetic Mean only in the ratio $\sqrt{3} : 1$. Whereas in the more frequent case of the divergence in the direction of *lepto-kurtosis*, the probable error of the Arithmetic Mean may exceed that of the Median to *any* extent. Such excess will be indeed rare. But it is quite within the range of ordinary experience that the probable-error of the Median should be *nearly* as small as that of the Arithmetic Mean. In fact, for the value of the coefficient λ, which may be considered on the limit of ordinary experience, namely ·2, the probable-errors of the two determinations are almost equal (in the case of symmetry).

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* If we have found approximate values of κ and λ it would be possible to utilise these values for dividing the tract which encloses the Median; but I am not sure that it would be worth the trouble.

The Median may even have an advantage in another respect. The observed Median admits of correction by means of the other observations. Though it is the point from which those observations are reckoned, the central pillar on which the other parts of the construction mainly rest, yet archwise it may derive some support from those other parts.† Whereas a similar correction of the Arithmetic Mean, though contemplated perhaps by Demorgan,‡ is not usual, nor I think easy.

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* Rhind, *Biometrika*, vol. vii, p. 127.

† Thus, as here suggested (below, p. 744), the unknown small quantity m may be taken account of at the second approximation.

‡ *Calculus of Probabilities*, p. 136.

So far theoretically, on the supposition that the data have the degree of perfection suited to the Method of Moments. But as pointed out on an earlier page, that degree of perfection is not unfrequently wanting. Then the Method of Moment begins to be suspect. We may have to be content with the Method of Percentiles. It may add to our contentment to know that even if we had a choice there would not be so much to choose between the two species of average.

There remains one large quantity, namely, a. This remaining obstacle to the use of large numbers is easily removed by considering that a differs by a small quantity of the order of κ and λ from the constant above described as the "quasi-modulus," what the constant of dispersion would be if κ and λ were known to be zero. Or rather, it is preferable, as in the investigation of the true Modulus for a normal group,* to take as the first approximation the *inverse* quasi-modus. Thus, let $\frac{1}{a} = h + \alpha$ where α is a small magnitude of the order of κ and λ; all three may easily be evaluated after that the constant h has been ascertained.

To ascertain h we have to find that value thereof which makes $-\mathrm{T}$ a maximum when κ, λ (and m) are each zero. Now, in general

$$\mathrm{T} = \tfrac{1}{2}\mathrm{N}\Sigma\frac{1}{\mathrm{U}_r}\left[\frac{\Delta(x_r - \mathrm{X}_r)\eta_r}{\mathrm{X}_r'}\right]^2;$$

and in the particular case where κ and $\lambda = 0$, this becomes (the numerator and denominator of E_r, the fraction within square brackets, being each divided by a)

$$\tfrac{1}{2}\mathrm{N}\Sigma\frac{1}{\mathrm{U}_r}\left[h\Delta x_r\eta_r - \Delta\xi_r\eta_r\right]^2.$$

Put $$\Delta\xi_r\eta_r = \mathrm{P}_r \text{ and } \Delta x_r\eta_r = \mathrm{Q}_r,$$

and we have for the expression to be minimised (omitting the factor N/2) $\Sigma\frac{1}{\mathrm{U}_r}\left[\mathrm{Q}_r h - \mathrm{P}_r\right]^2$. This expression primarily obtained with reference to positive values of r, percentiles on the right of the adjusted Median, which is taken as origin, proves equally true of terms involving negative abscissæ x_{-r} and ξ_{-r} measured from the origin to the left.† From the abbreviated expression for T, differentiating it with respect to h, we at once find

$$h = \Sigma\frac{\mathrm{P}_r\mathrm{Q}_r}{\mathrm{U}_r}\Big/\Sigma\frac{\mathrm{Q}_r}{\mathrm{U}_r}$$

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* Compare *J.R.S.S.*, vol. 71 (1908), p. 388 *et seq.*

† As we are concerned only with *squares* of the E's it is indifferent whether for P_{-r} we write $\xi_{-r}\,\eta_{-r} - \xi_{-(r+1)}\,\eta_{-(r+1)}$, or the *negative* thereof; and the sign of Q_{-r} is likewise conventional. I have used the former formulæ mostly in the tables, but in Table VII, having inadvertently used the latter, I have not thought it worth while to make an alteration for the sake of consistency. The *quaternary* quantities, the final coefficients, are not affected by our choice of signs for the P's and Q's pertaining to the negative compartments.

(all the given values positive and negative of r being taken); seeing that the second differential with respect to h is, as it ought to be for a minimum, positive.

Substituting this value for h in T, we have now a function of three small variables to be minimised. This is easily effected by expanding T in ascending powers of κ, λ, and z as far as terms of the second order inclusive, and then differentiating with respect to each of those variables separately. We thus obtain a system of three linear equations for κ, λ, and z.

Let us lighten the task of solving these simultaneous equations by introducing the variables one by one. And first let κ only be variable, λ and z being each zero. We have then for the expression to be minimised

$$\Sigma\frac{1}{U_r}\left[\Delta\eta_r\frac{x_r h - \xi_r - \kappa\xi_r^2}{1 + 2\kappa\xi_1}\right]^2.$$

Expanded in ascending powers of κ the expression within the square brackets, the error of area which we have called E_r, becomes $(Q_r h - P_r) - 1\kappa(\Delta 2x_r h\xi_r\eta_r - \Delta\xi_r^2\eta_r) + \kappa^2(\Delta 4x_r\xi_r^2\eta_r - 2\Delta\xi_r^2\eta_r) + \ \ldots$; where Q_r and P_r have the meaning just now defined. Analogously to that definition I propose to call $x_r\xi_r\eta_r$, Q', and $\xi_r^2\eta_r$, P'; $x_r\xi_r^2\eta_r$, Q'', and $\xi_r^3\eta_r$, P''. It will be observed that $\xi_r\eta_r$ and $\xi_r^3\eta_r$, the makings of P and P'', become negative for negative values of r: whereas the makings of P'—denoted by an *odd* number of dots—remain positive, while r changes its sign. Similar propositions are true of the Q's. I propose to describe P, P', P'' . . . Q, Q', Q'' . . . as *secondary* quantities, in contradistinction to the *data* from which they are derived, the observed percentiles and corresponding areas, and the quantities immediately connected therewith, namely, ξ_r the abscissa of the unit error-curve corresponding to the percentile x_r, η_r the ordinate of the error-curve, and U_r the (proportionate) area of the rth compartment. Again, I propose to name the coefficients of E_r (the expression within square brackets pertaining to any the rth constituent of T) respectively,

$$A(= Q_r h - P_r),\ B(= 2Q_r'h - P_r'),\ F(= 4Q_r''h - 2P_r'');$$

and to describe them as the *tertiary* quantities. We have, then, for any the rth compartment $E_r^2 = A_r - \kappa B_r + \kappa^2 F_r$. Whence we obtain for the expression to be minimised

$$\Sigma\frac{1}{U_r}\left[A_r^2 - 2\kappa A_r B_r + \kappa^2(B_r^2 + 2A_r F_r)\right].$$

Whence $$\kappa = \Sigma\frac{1}{U_r}A_r B_r/\Sigma\frac{B_r^2 + 2A_r F_r}{U_r}.$$

The constituents of the numerator and denominator in the expression for κ may be described as *quaternary* quantities. They may be written respectively $\left(\frac{dT}{d\kappa}\right)_0$, $\left(\frac{d^2T}{d\kappa^2}\right)_0$; meaning that after differentiation zero is put for κ.

Now let us introduce one of the variables which have been abstracted, namely, α. Then E_r will be augmented by terms including α; becoming now

$$E_r = A_r - \kappa B_r + F_r\kappa^2, + Q_r\alpha - 2\kappa\alpha Q'_r.$$

Whence for the constituent of the expression to be minimised, we have

$$\Sigma\frac{1}{U_r}\Big[A_r^2 - 2\kappa A_r B_r + \kappa^2(B_r^2 + 2A_r F_r),$$
$$+ 2\alpha Q_s A_r - 2\kappa\alpha Q_r B_r - 4\kappa\alpha Q_r' A_r + Q_r^2\alpha^2\Big]$$

Of the newly-introduced terms (marked off by a comma) the first vanishes, since $\Sigma\frac{1}{U_r}Q_r A_r = U$ is the equation for h. The coefficient of $- 2\kappa\alpha$, namely, $\Sigma\frac{1}{U_r}Q_r B$, together with $2\Sigma\frac{1}{U_r}Q_r' A_r$, is small, of the same order. I think we may say as κ, or rather as κ/h,* since, like (the numerator of) κ, it is made up of positive and negative terms. Accordingly, the new equation introduced by taking α into account, namely,

$$\left(\frac{dT}{d\alpha}\right) = \alpha\Sigma\frac{Q_r^2}{U_r} - \kappa\Sigma\frac{Q_r'B_r + 2Q_r'A_r}{U_r} = 0,$$

while on the one hand it is easily utilised, is on the other hand not very useful. For, combined with the equation $\left(\frac{dT}{d\kappa}\right) = 0$, the new equation furnishes a correction of κ which is of the second order. But we are now seeking only a first approximation to κ: and it is a canon of mathematical elegance not to introduce some while omitting other corrections of a certain order. We may therefore, I think, postpone the introduction of α.

Before going further it may be well to enforce the portion of doctrine which has been stated by means of a concrete illustration. For this purpose there is required an example with a slight, but sensible, degree of asymmetry, and no, or very little, *kurtosis*. The first condition is well fulfilled by (most of the) statistics of barometric heights which Professor Pearson has compiled.† Let us select one of the groups which fulfils also the second condition. This will easily be effected if we find a case for which the coefficient β is nearly equal to ϵ, both small, but not very small. For then, as shown on an earlier page,‡ $\lambda = \epsilon - \frac{8}{9}\beta, = \frac{1}{9}\beta$ nearly, and so may be considered very small. These conditions appear to be fulfilled by the statistics of barometric heights at Churchstoke.* For this group the Pearsonian constants β_1 and η are respectively ·12578 and ·18891. Accordingly our constant $\beta \left(=\frac{1}{8}\beta_1\right) = {}$·01572, and our constant $\epsilon \left(=\frac{1}{12}\eta\right) = {}$·01574, $\lambda = \frac{1}{9}$·0157 = ·0017; while $\chi = \frac{4}{9}\beta =$ ·0069. Whence $\kappa = \sqrt{\chi} =$ ·083.

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* For the purpose of the *first* Sub-section it might have been more elegant to put for $1/a$ not $h + a$ but $h(1 + \theta)$; so that θ a small *numeric* would be comparable with κ.

† See *Transactions of the Royal Society*, 1897, vol. 190 A.

‡ *Ante*, p. 316.

That is the value of κ when the operand, the generating error-curve, has unity for its *modulus*. But, if the *standard deviation* is taken for the unit, it is proper to divide the value of κ, which has been found by $\sqrt{2}$.† In the calculations which follow I shall employ the *standard deviation*, not as essentially preferable, but in order to avail myself of Dr. Sheppard's Tables.

Now, assuming that $\lambda = 0$, let us apply the Method of Percentiles to the data. or rather to a selection of them. For this purpose, having collected and rearranged the frequencies for each degree (of barometric height) as given by Professor Pearson, I take for the positions of the percentiles which are to be utilised the points on the abscissa corresponding to 275·5 (tenths of an inch), 297·5 302·5, together with the Median as determined on an earlier page,‡ viz., 299·744. The distance of the Median from the other percentiles gives us the observations designated x. The corresponding values of the area between each percentile and the Median is obtained by counting the number of observations occurring between those limits and dividing that number by half the total number. We thus obtain that integral which Dr. Sheppard designates "α" and takes as the argument of his convenient Table II.§ By means of that table we obtain for each of the utilised percentiles our ξ (his x) and our η‖ (his z). We thus obtain the *primary* quantities which are exhibited in the first part of Table VII.

TABLE VII.

Showing the evaluation of small constants in a case where there is no *kurtosis*.

PART I. PRIMARY QUANTITIES.

Abscissa or compartment.	x.	$\frac{1}{2}\alpha$.	ξ.	η.	U.
− 1	2·757	·3015	·84699	·278696	·1985
− 0	0	0	0	·39894	·3015
+ 0	0	0	0	·39894	·2264
+ 1	2·243	·2264	·60196	·33283	·1487
+ 2	4·243	·3751	1·15084	·205737	·1249

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* *Loc. cit.*, p. 433.

† *Ante*, p. 306.

‡ Above, p. 729.

§ *Biometrika*, vol. II. I have utilised the first and second but not the third differences.

‖ This "η" has nothing to do with the Pearsonian "η" proper to the Method of Moments.

TABLE VII—*contd.*

PART II. SECONDARY QUANTITIES.

	Abscissa or compartment.	$\xi\eta$.	P.	$\xi^2\eta$.	P′.	$\xi^3\eta$.	P″.
A	− 1	− *·23605*	+ ·23605	*·1999*	− ·1999	− *·16932*	+ ·16932
	− 0	*0*	− ·23605	*0*	+ ·1999	*0*	− ·16932
	+ 0	*0*	·20035	*0*	·12060	*0*	·0726
	+ 1	*·20035*	·03642	*·12060*	·15188	*·0726*	·2410
	+ 2	*·23677*	− ·23677	*·27248*	− ·27248	*·31358*	− ·31358

	Abscissa or compartment.	$x\eta$.	Q.	$x\xi\eta$.	Q′.	$x\xi^2\eta$.	Q″.
B	− 1	− *·76836*	+ ·76836	*·65079*	− ·65079	− ·55121	+ ·55121
	− 0	*0*	− ·76836	*0*	+ ·65079	0	− ·55121
	+ 0	*0*	·74654	*0*	·44936	0	·2705
	+ 1	*·74654*	·12640	*·44936*	·55525	·2705	·8856
	+ 2	*·89294*	− ·87294	*1·0045*	− 1·0046	1·15613	− 1·15613

	Compartment.	PQ.	PQ/U.	Q^2.	Q^2/U.
C	− 1	*·18137*	·9137	*·590377*	2·974
	− 0	*·18137*	·6015	*·590377*	1·958
	+ 0	*·14957*	·661	*·557328*	2·462
	+ 1	*·00460*	·031	*·15977*	·107
	+ 2	*·20669*	1·655	*·762024*	6·101
	Sums ...	....	3·862	....	13·602

PART III. TERTIARY QUANTITIES.

Compartment.	A.	B.	F.
− 1	− ·01784	− ·1697	+ ·2875
− 0	+ ·01784	+ ·1697	− ·2875
+ 0	·01167	·13464	·1621
+ 1	− ·0005	− ·1635	·5241
+ 2	− ·01114	− ·29812	− ·68620

See note to p. 734 as to the signs of P, P′ . . . Q, Q′ . . .

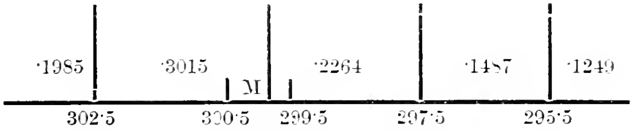
TABLE VII—*contd.*

PART IV. QUATERNARY QUANTITIES.

Compartment.	$-\left(\frac{dT}{d\kappa}\right)_0$	$\left(\frac{d^2T}{d\kappa^2}\right)_0$	$-\left(\frac{d^2T}{d\kappa d\alpha}\right)_0$
− 1	·0152	·093	− ·355
− 0	·0104	·061	− ·355
+ 0	·0069	·097	·49
+ 1	− ·0006	·180	·135
+ 2	·0266	·834	1·904
Sums	·059	1·265	1·82

Two of the primary quantities, the x's (by implication) and the U's, are exhibited in Figure 10.

FIG. 10.



To derive the *secondary* quantities we first form $\xi_r\eta_r$ and $x_r\eta_r$ for each percentile, and then multiply each of these products by successive powers of ξ_r; attending carefully to the *signs* of the x's and the ξ's. The *italicised* figures in Part II of the table show the results of these multiplications: from which by a simple subtraction we derive the *secondary* quantities, the P's and Q's shown in Part II, A and B, of the table. In Part II C is shown the calculation by which h is determined. From h, together with the P's and Q's, we derive the *tertiary* quantities, the A, B, and F, shown in Part III of the table.

Part IV shows the *quaternary* quantities from which the value of κ is immediately derived. It proves to be ·059 1·265 = ·05 nearly; a result which agrees fairly well with that above obtained by the Method of Moments (with reference to *standard deviation*), namely, ·06.

By taking account of α we may obtain a correction for κ, while verifying the proposition that the correction is not very important. For the coefficient of $-2\kappa\alpha$ in the expression for T, viz., $\Sigma(Q_rB_r + 2Q_r'A_r)\ U_r$, I find from the first three parts of the table 1·82. And the coefficient of α^2 (in T), namely, $\Sigma\frac{Q_r'^2}{U_r}$, is as shown in Part II C of the table, 13·6. Whence $\alpha = \cdot134\kappa$. Also from the equation $\frac{dT}{d\kappa} = 0$ we have $-1\cdot82\alpha + 1\cdot265\kappa = \cdot059$. Eliminating α we have for the corrected value of κ, ·058, almost identical with the value obtained by Moments, viz., ·059.

Let us now introduce the variable λ, at first by itself. We may now write the content of the square brackets in any constituent of the expression for T

$$\mathrm{E}_r = \mathrm{A}_r - \lambda\,\mathrm{C}_r + \lambda^2\mathrm{H}_r\,;$$

where A has the signification already defined ; $\mathrm{C} = 3\mathrm{Q}''h - 2\mathrm{P}''$; $\mathrm{H} = 9\,\mathrm{Q}'''h - 6\,\mathrm{P}'''$; Q_r''' and P_r''' being devised from Q_r and P_r by continued multiplication of ξ_r after the analogy of Q′, Q″, and P′, P″. We may now proceed at once to evaluate λ by squaring the last-written expression for each element, dividing by U_r, summing up all the constituents of T, and differentiating the sum with respect to λ. But the value so obtained for λ would not be as good as the value similarly obtained for κ. For in the case of λ it is found that α cannot safely be ignored. The coefficient of $\alpha\lambda$ in the expression for T, unlike that of α, proves not to be small for small values of λ, but substantial. The expression to be squared for each constituent is now—

$$\mathrm{A} - \lambda\mathrm{C} + \lambda^2\mathrm{H}, + \mathrm{Q}\alpha - \alpha\lambda 3\mathrm{Q}''\mathrm{A},$$

whence squaring, dividing by U_r, summing, and differentiating by λ and by α, we obtain the simultaneous linear equations (the absolute term in the first equation vanishing as before)—

$$\Sigma\frac{\mathrm{Q}_r^2}{\mathrm{U}_r}\alpha - \lambda\Sigma\frac{\mathrm{Q}_r\mathrm{C}_r + 3\mathrm{Q}_r''\mathrm{A}_r}{\mathrm{U}_r} = 0$$

$$-\alpha\Sigma\frac{\mathrm{Q}_r\mathrm{C}_r + 3\mathrm{Q}_r''\mathrm{A}_r}{\mathrm{U}_r} + \lambda\frac{\mathrm{C}_r^2 + 2\mathrm{A}_r\mathrm{H}_r}{\mathrm{U}_r} = \Sigma\frac{\mathrm{A}_r\mathrm{C}_r}{\mathrm{U}_r}.$$

The values of α and λ are easily found from these equations.

What further explanation of the method is required may be conveyed by working an example. Unfortunately none of the concrete symmetrical groups with which I am acquainted are quite suited for this purpose. One is too nearly normal, so that the λ coefficient elicited is almost invisible ; another is so far from normal as to raise a doubt whether it does not belong to Sub-section II. Accordingly, I have thought it best to construct a fictitious example. I have "translated" a normal error-curve with standard deviation unity by putting for the abscissa of the constructed curve $\mathrm{X} = \xi + {\cdot}01\,\xi^3 \ldots$ We have thus the coefficient $a = 1$, $\lambda = {\cdot}01$. Supposing that these coefficients have to be discovered from observed percentiles of the constructed group ; let us take for the percentiles to be utilised the values of x (the abscissa of the observed frequency-group or in Professor Pearson's terminology "histogram"), the value, which correspond to the round values of ξ (the abscissa of the generating normal curve) $\pm{\cdot}5 \pm 1 \pm 1{\cdot}5$. The observed values of x on this supposition are :—

$$x_1 = x_{-1} = {\cdot}5 + {\cdot}01 \times {\cdot}5^3 = 0{\cdot}50125$$

$$x_2 = x_{-2} = 1 + {\cdot}01 \times 1^3 = 1{\cdot}01$$

$$x_3 = x_{-3} = 1{\cdot}5 + {\cdot}01 \times 1{\cdot}5^3 = 1{\cdot}53375.$$

From Dr. Sheppard's Table I we easily find for each value of our ξ (his x) the corresponding value of our η (his z), and of twice the area intercepted between x and the centre (his α). Our U's are immediately obtained from (the halves of) his α's. Figure 11 shows the x's and U's. The values supposed to be the primary data, are shown in Part I of Table VIII. Part II of the Table shows the *secondary* quantities, the P's and Q's; which are obtained with less trouble than in the case of an asymmetrical group, since the P's and Q's with which we have now to deal have all

FIG. 11.

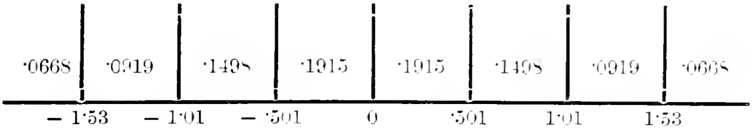


TABLE VIII.

Showing the evaluation of small constants in a case where there is no asymmetry.

PART I. PRIMARY QUANTITIES.

Abscissa or compartment.	ξ.	x.	η.	$\frac{1}{2}\alpha$.	U.
± 0	0	0	·39894	0	·1915
± 1	·5	·50125	·35206	·19146	·1498
± 2	1	1·01	·24197	·34134	·0919
± 3	1·5	1·53375	·12952	·43319	·0668

PART II. SECONDARY QUANTITIES.

	Abscissa or compartment.	$\xi\eta$.	P.	$\xi^3\eta$.	P″.	$\xi^5\eta$.	P^{IV}.
A	± 0	0	·176	0	·044	0	·011
	± 1	±·176	·066	±·044	·19797	±·011	·23097
	± 2	±·24197	·0477	±·24197	·19509	±·24197	·74141
	± 3	±·19425	−·19425	±·43706	−·43706	±·98388	−·98338

	Abscissa or compartment.	$x\eta$.	Q.	$x\xi^2\eta$.	Q″.	$x\xi^4\eta$.	Q^{IV}.
B	± 0	0	·17644	0	·04411	0	·01103
	± 1	±·17644	·06795	±·04411	·20028	± ·01103	·23336
	± 2	±·24439	−·04577	±·24439	·20250	± ·24439	·76112
	± 3	±·19862	−·19862	±·44689	−·44689	±1·0055	−1·0055

TABLE VIII—*contd.*

PART II. SECONDARY QUANTITIES—*contd.*

	Compartment.	PQ.	PQ/U.	Q².	Q² U.
C	± 0	*·03105*	·1622	·031131	·1625
	± 1	*·00448*	·0299	·001617	·0308
	± 2	*·002184*	·0238	·002095	·0228
	± 3	*·038581*	·5776	·039446	·5905
		....	·7935	....	·8066

PART III. TERTIARY QUANTITIES.

Compartment.	A.	C.	H.
± 0	− ·00243	·04218	·03166
± 1	+ ·00085	·19513	·6803
± 2	+ ·00267	·20745	2·2903
± 3	− ·00114	− ·44477	− 3·00217

PART IV. QUATERNARY QUANTITIES.

Compartment.	$-\left(\frac{dT}{d\lambda}\right)_0$	$\left(\frac{d^2T}{d\lambda^2}\right)_0$	$-\left(\frac{d^2T}{d\lambda d\alpha}\right)_0$
± 0	− ·0005	·0085	·037
± 1	+ ·0011	·262	·092
± 2	+ ·0059	·601	− ·086
± 3	+ ·0076	3·06	1·35
Sums	·014	3·93	1·4

an *even* number of dots. Inserting the P's and Q's into the proper formula, we elicit the value of k, viz., ·98375. Combining this value with those of the P's and Q's we calculate the *tertiary* quantities A, C, and H, shown in Part III of the table. From these we derive the *quaternary* quantities which are the values of

$$\left(\frac{dT}{d\lambda}\right)_0, \left(\frac{d^2T}{d\lambda^2}\right)_0, \left(\frac{d^2T}{d\lambda d\alpha}\right)_0.$$

Differentiating the expression for T with respect to λ and α separately we obtain for these variables the simultaneous equations—

$$\begin{aligned} \cdot 8066\alpha - 1\cdot 4\lambda &= 0 \\ -1\cdot 4\alpha + 3\cdot 93\lambda &= \cdot 014. \end{aligned}$$

Solving these equations we find $\lambda = \cdot 009$ $\alpha = \cdot 0155$; good approximations to the true values (known in this case), namely, $\lambda = \cdot 01$, $\alpha\ (= 1 - \cdot 98375) = \cdot 01625$.

It will occur to the expert in Probabilities who may cast his eye over this calculation that the result depends in an undue degree upon one item of the data, one strand of the coil, that which pertains to the outmost double compartment, designated by the subscript ± 2. The character of a *republic* proper to the constituents in the calculation of a frequency-constant seems wanting. What has happened is, I think, that the set of percentiles utilised is one not very favourable for the accurate determination of the sought coefficients. *Any* set of percentiles, if not too few or too numerous, supply data adequate for the determination of the coefficients by Inverse Probability. But the determination is not equally good for all sets of percentiles; the "probable errors" to which the result is liable are greater or less according as one or other set of percentiles is utilised. The matter is particularly simple where we have to deal with only one coefficient, our constant a, which we may regard as the *standard deviation*. Taking the *reciprocal* of a, say as before h, for the *quæsitum*, and determining it by Inverse Probability as applied in an earlier page and explained in an earlier Paper,* we find that the errors to which the determination is liable fluctuates according to a normal error-curve of which twice the mean square of error (= the square of the Modulus) is the reciprocal of $N\Sigma Q_r^2/U_r$.† This measure of inaccuracy becomes smaller the larger N is, and the larger the sum of squares which is multiplied by N. Given the number of observations, and using a number of percentiles consistent with the number of observations, it is desirable to select the percentiles so that the sum of terms of the type Q_r^2/U_r should be as large as possible. Starting with the set of percentiles which comes first to hand, we may improve upon it by a series of somewhat laborious tentatives. When there are two or three *quæsita* (a, κ, λ) the arithmetical labour is aggravated by a philosophical difficulty. But it will be time enough to prescribe for the selection of the best set of percentiles when the proposal to use percentiles has been accepted by experts.

I likewise postpone the full exposition and exemplification of the general case which subsumes the particular cases which have been treated, the case in which both κ and λ as well as α are sought variables. Suffice it to say that in the general case the error in area E_r receives an additional term $\kappa\lambda G_r$, where $G_r = 12\,Q_r''' - 7\,P_r'''$; becoming $A_r - \kappa B_r - \lambda C_r + F\kappa^2 + G\kappa\lambda + H\lambda^2$ Whence the quantity which is to be maximised,

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* *J.R.S.S.*, 1908.

† It may excite suspicion that this expression for the mean square of the error incurred should differ from that which has been given by Dr. Sheppard in his classical treatment of the subject (*Transactions of the Royal Society*, 1898A, vol. 192, pp. 131, 132). The explanation of the difference is, I think, that he has employed for the determination of the standard-deviation from observed percentiles a rule which, though a good rule, and, it may be, practically the best, as being the simplest, rule, is not the theoretically best rule—that which is given by Inverse Probability. Between Dr. Sheppard's and our formula for the Standard Deviation, is there not the same relation as between Galton's simple formula for the determination of the *correlation-coefficient* (in the case of two variables) and the less simple, but more accurate formula which Professor Pearson obtained by a stroke of Inverse Probability (*cp.* *J.R.S.S.*, 1908, vol. lxxi, p. 395)?

$$-T = \tfrac{1}{2}N\Sigma\frac{1}{U_r}\Big[A_r^2 - 2\kappa A_rB_r - 2\lambda A_rC_r + \kappa^2(B_r^2 + 2A_rF_r) + \lambda^2(C_r^2 + 2A_rH_r) + \alpha^2Q_r^2 + 2\kappa\lambda(B_rC_r + A_rG_r) - 2\lambda\alpha(QC + 3Q''A)\Big]$$

—the term $\kappa\alpha$ with its coefficient being for a reason before given. Differentiating with respect to κ, λ and α separately, we obtain the three simultaneous linear equations for those variables.

Good examples of the general case may be found among the statistics of barometric heights to which reference has been already made. I have begun the work for one of them, the one which I long ago used to exemplify simpler species of translation,* the group of barometric heights at Babbacombe. By method of interpolation before practised,† as well as by the more refined adjustment now proposed, I find for the *Median* 300 (tenths of an inch). For the other percentiles to be utilised I take 295·5, 297·5, 302·5, 034·5. Counting the numbers of observations intercepted by these points, as stated in my earlier Paper,‡ I have obtained with the aid of Dr. Sheppard's tables the *primary* quantities. From a rough approximation to the *secondary* and subsequent classes of coefficients, I am led to anticipate for the calculation if accurately performed a plausible result, one in accordance with previous determinations. I trust that the work will be completed by some more industrious and accurate arithmetician.

It is a nice question whether there should be added to this subsection a praxis for the determination of *second* approximations to the values of κ, λ, and α. With their corrections of the second order, say, $\delta\kappa$, $\delta\lambda$, might be ranged m, the correction of the adjusted Median presumed to be of the second order. We should expand each constituent of the type E_r so as to include (before differentiation) quantities of the *third* order, such as κ^3, $\kappa^2\lambda$, $\kappa\delta\kappa$, $\kappa\delta\lambda$, κm . . . The new small quantity m will enter by substituting for each positive abscissa x $(x_r + m)$ (supposing that the apparent Median which is to be corrected is on the *right* of the true Median) and for each negative abscissa—x_r, $-(x_r - m)$. But I doubt whether it is worth the trouble to institute so laborious a calculation, appropriate only to a particular degree of abnormality. I proceed to the more general case of considerable abnormality.

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* See *J.R.S.S.* "Mathematical Representation of Statistics," 1898, p. 680 *et seq.*

† *Loc. cit.*, p. 698.

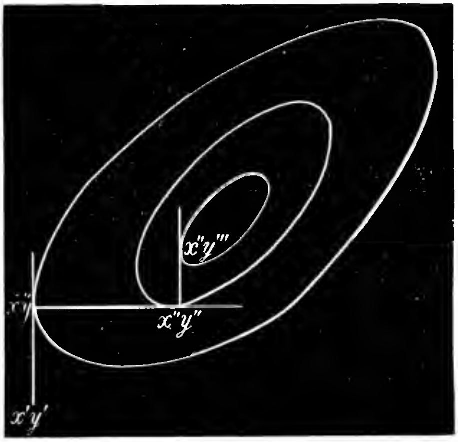
‡ The observations given by Pearson, *Phil. Trans.*, 1897, vol. 190, A, p. 433.

SUB-SECTION II.—CONSIDERABLY ABNORMAL CURVES.

The class of frequency-groups which is now to be considered is characterised by constants of such magnitude that the expansion in ascending powers of the function which is to be maximised is no longer available. The subject may be approached by way of the following lemmas.

Lemma 1. It is required to find an approximation to the values of x and y which make $f(xy)$ a maximum; when f is such a function that if $\left(\frac{df}{dx}\right)$, say f_1, and $\left(\frac{df}{dy}\right)$, say f_2, are simultaneously equated to zero the solution of the system would be impracticably laborious, but the solution of one of the derivative functions, *e.g.*, $f_1(xy)$ equated to zero for the corresponding variable x, the other variable being treated as constant, is not impracticable. (For example, the conditions would be fulfilled if $f(xy)$ were a rational algebraic function of the fourth degree.) To obtain a rough approximation I propose the following process. Considering $z = f(xy)$, as the equations of a surface, find a point $x'y'$ in the neighbourhood of a maximum value of z, or at least at a finite distance therefrom. Substituting one of the co-ordinates, say x', in the function derived by the differentiation with respect to the other variable, *i.e.*, in the case supposed $f_2(xy)$, solve the equation $f_2(x'y) = 0$ for y, and obtain thereby a maximum value of z (relative to x' constant), which is greater than $f(x'y')$, say $f(x'y'')$. Now put y'' constant in the equation $f_1(xy'') = 0$; and, solving for x, obtain a value of z, $f(x''y'')$, which is greater than $f(x'y'')$. And so on. Fig. 12 is designed to illustrate the process of climbing up hill, so to speak. The successive curves are members of the

FIG. 12.



family z = constant; one of which is *touched* at each stopping-point by one of the co-ordinates of that point. The method, enounced with reference to two variables, is capable of extension to functions of three or more variables.

Lemma 2. The other conditions being the same, let the function f be such that the equations $f_1 (xy') = 0$, $f_2(x_2'y) = 0$, are both —or at least one of them—impracticable. Starting from a suitable point $x'y'$, observe the sign of one of the derivate functions, say $f_1(x'y')$; and take a step Δx (the direction corresponding to the function selected, say f_1), such that Δx (with its sign) multiplied by $f (x' y')$ is positive. Putting x'' for $x' + \Delta x$ observe whether $f_1(x''y')$ is greater than $f_1(x'y')$. If not, take a shorter step (from the point $x'y'$). If $f_1(x''y') > f_1(x'y')$, either take another (and another) step parallel to the axis of x; or take a step parallel to the axis of y, observing the sign of f_2, and taking Δy of such a sign that $\Delta y f_2$ may be positive. And so on. That is supposing *both* the equations $f_1(xy') = 0$, $f_2(x'y) = 0$ to be impracticable. But, if one of them, *e.g.*, $f_2(x'y) = 0$, is soluble, it may be used to determine the *extent*—as well as the direction—of a step parallel to the axis of y. Like the first lemma, the second lemma may be extended to three or more dimensions.

That variety of the second lemma, in which there are *three* independent variables, the derived function relative to *one* of them being manageable, is in general appropriate to our problem. But for the purpose of illustration, an example with only two variables will suffice. I have constructed such an example by *translating* a normal error-curve with unit standard deviation to a curve in which the abscissa χ (measured from the Median) $= \xi + {\cdot}05\ \xi^3$. That it is not safe to neglect the higher powers of λ is suggested by the circumstance that if we were to do so when using the Method of Moments, we should put $\lambda = {\cdot}077$, that being the value of the constant ϵ, the first term in the expression for λ. A practitioner who should be so incautious as to apply here the method proper to our first sub-section would run the risk of tumbling into a pitfall; for instance, obtaining values for the *quaternary* coefficients which are the second differentials of T inconsistent with the condition that T should be a minimum (— T a maximum).* As in a former example, let us take for the percentiles to be utilised those which have (for the generating curve) $\xi_1 = -\xi_{-1} = {\cdot}05$, $\xi_2 = -\xi_{-2} = 1$, $\xi_3 = -\xi_{-3} = 1{\cdot}5$. The corresponding values of x are given in Part I of Table IX. Figure 13 exhibits the U's and x's.

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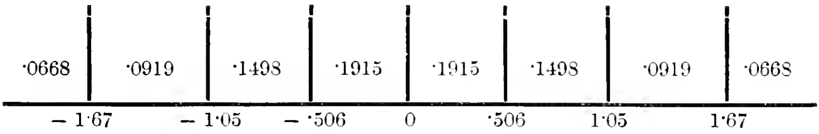
* Thus, in the case of two variables λ and a we should have

$$\frac{d^2\mathrm{T}}{d\lambda^2}\ \frac{d^2\mathrm{T}}{da^2} > \left(\frac{d^2\mathrm{T}}{d\lambda da}\right)^2.$$

It may be observed that this condition is fulfilled by the values of λ and a found in our second example above, p. 742 (*a fortiori*, by our first example).

FIG. 13.



Our first step is to find a suitable initial point, two values of a and λ corresponding to the x' and y' of the lemma. As appropriate are suggested the values of those variables which would obtain if the group were normal; that is, the quasi-standard-deviation for a, and for λ zero. The reciprocal of the required value of a may be determined by the process appropriate to Sub-section I. From the *primary* data presented in Part I of Table IX we advance by a now familiar procedure to the *secondary* quantities tabulated in Part II. Whence h, the required constant, is found to be ·92 (a = 1·087).

TABLE IX.

Showing first steps in approximation to large constants.

PART I. PRIMARY QUANTITIES.

Abscissa or compartment.	ξ.	η.	x.	U.
± 0	± 0	....	± 0	·1915
± 1	± ·5	·352	± ·50625	·1498
± 2	± 1	·24197	± 1·05	·0919
± 3	± 1·5	·1295	± 1·66875	·0668

PART II. SECONDARY QUANTITIES.

Compartment.	P.	P″.	Q.	Q″.	PQ U.	Q² U.
± 0	·176	·044	·17819	·04705	·1637	·1658
± 1	·066	·198	·0159	·207	·0334	·0384
± 2	− ·0477	− ·195	− ·03797	·2322	·0197	·0157
± 3	− ·1942	− ·4371	− ·2161	− ·4862	·6284	·6990
Sums	....	....	....	....	·8452	·9189

PART III. TERTIARY QUANTITIES.

Compartment.	A.	C.	A²/U.
± 0	− ·012	·0419	·00074
± 1	·0038	·1753	·0001
± 2	·0128	·2504	·0018
± 3	− ·00455	− ·4671	·0003
	...	....	·0029

TABLE IX—*contd.*

PART IV. QUATERNARY QUANTITIES.

Compartment.	AC.	AC/U.
± 0	− ·0005	− ·0026
± 1	·0007	·0045
± 2	·0032	·035
± 3	·00213	·032
Sum	....	·07

Our next step is to vary λ from its initial value, zero. In order to determine in which direction we ought to move (which for the sake of the example we must be supposed not to know), we have to observe the sign of $\left(\frac{dT}{d\lambda}\right)$. This is one of the *quaternary* quantities specified in the first sub-section, and it is to be ascertained according to the rule there given, by summing the elements of the type A_rC_r/U_r. From an examination of (the sign of) the quantity so obtained, we learn that it is desirable to *increase* λ. Let us take a round number, small yet sensible, viz., ·02, for the increment of λ. We have now to form the expression ΣE_r^2 with $h = {}$·92 and $\lambda = {}$·02. For this purpose there may be suggested a variant of the former procedure. Substitute for the η_r of the first Sub-section $H_r{}^* = \eta_r/(1 + 3\lambda\xi_r^2)$, where $\lambda = {}$·02; for $\eta_r\xi_r$ substitute $H_r\Xi_r$, where $\Xi_r = \xi_r + \lambda\xi_r^3 (\lambda = {}$·02), and call $\Delta H_r\Xi_r = \Pi_r$. Likewise let $\Delta x_r H_r = \Gamma_r$. We thus obtain a set of *modified secondary* quantities shown in Table X; which may be used in calculating the value of ΣE_r^2 for $a = 1/$·92, $\lambda = {}$·02. We have only to form the *tertiary* quantities Λ according to the familiar rules, from Π's and Γ's now, as before, from P's and Q's; and then to form the sum $\Sigma\Lambda_r^2/U_r$. Whereas the sum so formed was, prior to the variation of λ, about ·0029, it has now become ·0019.

To proceed to a smaller value of T, a higher value of $-T$, let us now take a step in the α (or $1/a$) direction; a step which need not be in the dark, as it were, like that of λ, but may be determined in extent as well as direction by a simple equation. We have only to operate on the modified secondary quantities as if we were seeking the value of h *de novo*. We thus obtain for h_1 the best value of h where $\lambda = {}$·02, $h_1 = (\Sigma \Pi_r \Gamma_r / U_r) / (\Sigma \Gamma_r^2 / U_r)$, that is ·955. In fact, substituting ·95 for h and thus re-calculating the Λ's, I now find for ΣE_r^2, ·0011. The way is open for another step in a direction parallel to the axis of λ.

When we have reached values of λ and $1/a$, say λ_0 and h_0, in the near neighbourhood of the maximum, it will be possible by

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* This symbol is to be understood as capital *eta*, quite distinct from the "H" of Sub-section I.

TABLE X.

Showing method of approximation to large constants (*continued*).

PART I. PRIMARY QUANTITIES.

Abscissa or compartment.	ξ.	Ξ.	η.	H.	x.	U.
± 0	0	0	....	....	0	·1915
± 1	± ·5	± ·5025	·352	·3468	± ·50625	·1498
± 2	± 1	± 1·02	·24197	·22828	± 1·05	·0919
± 3	± 1·5	± 1·56	·1295	·1141	± 1·66875	·0668

PART II. SECONDARY QUANTITIES.

Abscissa or compartment.	ΞH.	Π.	xH.	Γ.	ΠΓ U.	Γ^2/U.
± 0	*0*	·17427	*0*	·1756	·160	·161
± 1	± *·17427*	·05858	± *·17557*	·0641	·0251	·0274
± 2	± *·23285*	− ·05400	± *·23969*	− ·0493	·0292	·0266
± 3	± *·17885*	− ·17885	± *·1914*	− ·1904	·51	·543
Sums ...	....	....	....	....	·724	·758

substituting $\lambda_0 + \delta\lambda$ for λ, and $h_0 + \delta h$ for 1 a, in the expression which is to be minimised, expanding in ascending powers of $\delta\lambda$ and δh and differentiating, to obtain simultaneous linear equations for $\delta\lambda$ and δh, and by repeating the operation to obtain as near an approximation as possible (as the inaccuracy of the data permits) to the true values of the coefficients. But query whether it would be worth the trouble thus to improve upon the method of the main process of approximation.

The procedure which has been exemplified for two variables may be extended to several variables, to the coefficient κ in addition to λ and α, and to other variables attributes in addition to x—the case of *surfaces* which is to be considered in the following, and concluding, section.

(*To be continued.*)

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—***Final Report of the Departmental Committee on Local Taxation.*** [Cd-7315.] 1914. vi + 120 pp. Price 1*s.*

The Departmental Committee on Local Taxation was originally appointed "to inquire into the changes which have taken "place in the relations between Imperial and Local Taxation since "the Report of the Royal Commission on Local Taxation in 1901; "to examine the several proposals made in the Reports of that Commission, and to make recommendations on the subject for the consideration of His Majesty's Government, with a view to the "introduction of legislation at an early date." Later the scope of the Committee's inquiry was extended so as to include the questions of the best means of obtaining a uniform basis of valuation for local taxation purposes in England and Wales, and the financial problems arising from the inequalities of local government rating areas. The present volume, which has been preceded by two volumes of evidence and memoranda, is the outcome of labours which have extended over two and a half years, and sets forth the conclusions of the Committee so far as they relate to England and Wales.

The rapid growth of local expenditure which had characterised the ten years preceding the Report of the Royal Commission was no less marked, and as regards education was greatly accentuated, in the succeeding decade. The following summary table shows this growth, and the proportions met out of Government subventions. The figures are not quite complete, but the omissions (expenditure on main roads in London and county boroughs, and salaries of county medical officers, and of medical and sanitary officers in many county boroughs) do not appreciably affect the conclusions to be drawn from the table :—

Year.	General local government services.*		Education (other than in poor law schools and reformatories).		Totals.	
	Total net expenditure.	Percentage of Government subventions.†	Total net expenditure.	Percentage of Government subventions.	Total net expenditure.	Percentage of Government subventions.
	Mill. £.		Mill. £.		Mill. £.	
1891-92 ...	15·33	39·8	5·18	44·2	20·51	40·9
1901-02 ...	21·34	34·0	11·59	45·0	32·93	37·9
1911-12....	26·25	28·4	28·62	48·3	54·87	38·8

* Including certain poor relief services, maintenance of lunatics and lunatic asylums, police and criminal prosecutions, &c., main roads outside London, salaries of medical and sanitary officers, &c.

† Whether definitely allocated or not, and including grants under the Agricultural Rates Act.

The two outstanding features of this table are the very remarkable advance in national expenditure upon education, and the pronounced fall in the proportion of Government contributions towards the cost of general local government services, even since 1901–02, when the Royal Commission had recommended an increase in such contributions. Moreover, though the State's share in the cost of education is still nearly one-half, it has fallen constantly since 1905–06, when it was as high as 53·7 per cent.

The Departmental Committee point out that the services to which the expenditure shown above relates have tended more and more, since their predecessors' Report, to pass from the class of "local services" (*i.e.*, services carried out by local authorities in the interest mainly of their respective localities and not markedly for the benefit of the nation as a whole) into the class of "semi-"national" or even "national" services—the line of demarcation between these two latter groups must necessarily always be somewhat indefinite. Accepting the principle enunciated by the Royal Commission, that the cost of services of the semi-national class should be borne jointly by national and local funds, the Committee were faced by the fact that, whilst the increase in expenditure has been due in no small measure to the tendency of Parliament to impose new obligations on the local authorities (not infrequently without consideration of the financial consequences, as in the case of the police weekly day of rest enactment), and of central departments to raise the standard of their requirements, the share of the burden borne by the State has been steadily decreasing. They felt, therefore, that the local authorities have substantial justification for their claim for enlarged subventions, though this claim has been occasionally put forward with small regard for other demands upon the Exchequer. Further, the conditions of the problem have been profoundly modified since 1901, in three ways:— by the operation of the Education Acts of 1902 and 1903, and the establishment of the Road Board: by the financial legislation of 1907–11, which modified the system of "assigned revenues," imposed additional taxes on real property, and introduced a scheme of national valuation; and by the legislation relating to old age pensions and sickness and unemployment insurance, which may be expected to check the growth, if it does not actually diminish, poor law charges, but may necessitate increased local expenditure in other directions.

In these circumstances the Committee, whilst concurring with their predecessors as to the reasonableness of increased Exchequer grants, have abandoned the proposal of the majority of the Royal Commission as to the *method* of such grants. That majority has favoured the continuance, and even extension, of the system of "assigned revenues" which had been introduced by the late Lord Goschen in 1888, though they recommended some modifications of a purely administrative character. The minority of the Commission favoured the method of "block grants" for groups of connected services, allocated according to a formula which should take into account, in respect of each authority, expenditure, necessity (measured by population) and ability (measured by assessable value), and should be revised decennially. The Departmental Committee now recommend the abolition of the system of "assigned revenues," and their proposal will, we believe, be approved by the great majority of persons interested in the problem of local finance. That system was one of the least successful of the first Lord Goschen's experiments. From the outset it was open to serious objection; subsequent developments had given rise, even by 1901, to "indefensible "anomalies and administrative inconveniences"; the arrangement complicated both local and national accounts; the money available was allocated on no uniform or equitable principle; and except in the case of the police grant, and, in a lesser degree, of some of the public health grants, it was ineffective in securing efficiency of services. Moreover, the hope that the assigned revenues would be so expansive as to obviate the need for further central grants and thus facilitate the severance of local from national finance, proved quite illusory; whilst in the last few years legislation has actually stereotyped the amounts receivable by local authorities in respect of an important part of these revenues. The whole arrangement, which at its best was administratively and financially unsound, has become hopelessly indefensible. In its stead the Committee recommend a series of direct Exchequer grants, based in most cases, except education, on necessity as measured by expenditure—the State proportions proposed being one-half in the case of police, criminal prosecutions, pauper lunatics, mental deficiency, and main roads, one-quarter in the case of county roads, and three-fifths in the case of poor law officers' salaries. As regards roads, it is suggested that the Road Board should carry out a complete re-classification. It is proposed that in place of the present charge on the assigned revenues in respect of salaries of sanitary officers there shall be a direct grant of 9*d*. per head of population in rural districts and 6*d*. per head in urban districts; whilst the education grant is to be calculated on the following formula:—36*s*. per child in average attendance + 40 per cent. of net expenditure — produce of a rate of 7*d*. in the £ over the area of the authority, provided that no area shall receive a grant exceeding two-thirds of its net expenditure so long as the balance is less than the produce of a 1*s*. rate.

The result of these, and some other less important proposals, if adopted, and of the consequential abolition of the grants under the Agricultural Rates and Tithe Rentcharge Rates Acts, is estimated, on the basis of the 1911–12 returns, to be a net increase of the annual Exchequer subventions by 4,700,000*l*. (2,385,000*l*. in respect of education and 2,315,000*l*. in respect of general services). The new scheme of distribution would affect some authorities adversely, and it is accordingly suggested that the necessary reduction in the grants to an authority shall not exceed 10 per cent. in any one year.

Whatever criticisms these recommendations are open to in respect of details (the proportions of the grants are certainly debatable—three members of the Committee, including the Treasury representative, think the original increase should be restricted to 1½ million £), they offer in place of the present unsatisfactory arrangements an intelligible and consistent scheme. The suggestion that *all* grants should be conditional on efficient administration and subject to a general power of reduction and regulation on the part of the Government Department concerned, though it will no doubt be objected to by those who regard any extension of control by central departments over local authorities as promoting bureaucracy, seems a national corollary of central financial assistance.

The other conclusions of the Committee, though valuable and suggestive, are less important than the settlement of the fundamental problem of the relations between central and local finance. As regards valuation, the Committee recommend that the work should be undertaken by the Land Valuation Department, which is proceeding on uniform principles throughout the country, subject to improved arrangements as to appeals. The inequalities in the rates levied on account of semi-national services will, they hope, be appreciably redressed by the adoption of their proposals as to the bases of the Exchequer grants, and they are not disposed to favour any compulsory enlargement of local government areas. There is unanimity in rejecting "as impracticable and impolitic" any scheme for raising the whole amount of local rates by a rate on land values, but six out of the thirteen members of the Committee, in a separate Report, argue that "any substantial addition to Imperial grants-"in-aid should be accompanied by a special rate upon the value of "land. Otherwise the main result of such contributions will be to "relieve the owners of site values, at the expense of the taxpayer, of "part of the rate-burden (which tends to fall ultimately upon them "under the present rating system) and consequently to enhance the "value of their property." Finally, it may be noted that in their examination of other possible sources of local revenue, the Committee have given careful consideration to the local income-tax system of Prussia, and have reached the conclusion, that no scheme of the kind would be practicable in this country. P.A.

2.—*Les Mathématiques appliquées à l'Économie Politique.* By Wl. Zawadzki. 331 pp., 8vo. Paris: Librairie des Sciences Politiques et Sociales. M. Rivière et Cie, 1914. Price 8 francs.

The appearance of this book is opportunely coincident with a revival of interest in the subject. The question, what is the worth of Mathematical Economics, has lately been re-opened in this country. A slashing article by a distinguished economist in the *Quarterly Review* has encouraged the natural disposition of the plain man to suspect paradoxical refinements. M. Zawadzki's temperate discussion of the question is calculated to mitigate the captiousness of the learned and the prejudices of the laity. He does not weaken his case by overstatement. Wiser than some of his predecessors, he does not put forward mathematical economics as a sort of social astronomy, capable of predicting economic phenomena quantitatively. More cautious than some recent writers, he does not press the analogy between Mechanics and Mathematical Economics. "Very little has been done up to the present," he candidly admits; "mathematical economics will always remain extremely abstract: "its theorems are only 'schemas' conducing to a comprehension "of the reality, but not the faithful image of that reality. They "will never be capable of direct application to practical cases." But the study is not, therefore, useless. It is valuable as an instrument of criticism, it is a powerful solvent of fallacious reasoning—a proposition which is inexact on the simplified suppositions proper to mathematical science can evidently not be exact in the more complex conditions of concrete reality. But the rôle of the new science is not entirely negative. It is required to impart a necessary precision to conceptions which play a great part in economic theory. We might instance the relation of Joint Production (Cp. Zawadzki, pp. 173, 219), upon the right understanding of which turn important issues respecting the public control of railways. Mathematics are required to express the mutual dependence of economic phenomena; averting vain controversies as to which of two correlated variables is the *cause* of the other. In preferring symbols to geometry for the purpose of exhibiting that interdependence our author goes further than some English writers. But they would not deny the advantage which algebra has over geometry in dealing with a great number of variables. Differences on points of doctrine must exist; but we think that the general feeling of economists, in this country at least, would accept as fair our author's estimate of what mathematical economics can and cannot do. The whole of his discussion on this subject appears to us to be permeated with what may be called scientific common-sense. As that is rather an uncommon quality, we are not precluded from also attributing to the work that rarity which is the condition of value.

But we think that an even higher value, for those at least who do not come fresh to the subject, attaches to the portions of the book which are devoted to the exposition of works on mathematical economics. The use, and we may add the "final utility," of this element not existing elsewhere in abundance is due to the difficulty which most people, however well instructed, find in reading other people's mathematical economics. As Dr. Marshall has said: "When a great many symbols have to be used they become very "laborious to anyone but the author himself." The labour imposed by new symbols may be aggravated by novelties in economic terminology; and the meaning may further be concealed by the difficulties of a foreign language. Confronted with this triple obstacle the reader may well hesitate; the doubt arises whether the immense labour of cracking the nut will be rewarded by the supreme excellence of the kernel. In these circumstances it is a singular advantage to have the leading doctrines of the leading writers presented in clear outline. The reader is guided to sources of knowledge which he can assimilate: he is introduced to authors whose further acquaintance he may desire. The service which M. Zawadzki has thus conferred falls under two heads. He acquaints the present generation with the earlier writers on the subject and he establishes communication between contemporary English-speaking and Continental economists. To prevent beginners being discouraged by the opening chapters, it may be well to explain that the work is not exactly an elementary text-book for the use of beginners. The history of "first tentatives" (Chapter I) towards a mathematical conception is not, in our opinion, and is not represented by our authors as, the best means of teaching that conception. Those who bring some knowledge of the subject to the perusal of M. Zawadzki's opening chapters will carry away much from his account of Von Thünen, Gossen, and other fathers. The study of Cournot is facilitated by judicious criticisms. Even Jevons, for whom our author has a due admiration, is simplified by the suggestion that his theory of economic dimensions should be ruled out: "though not exactly false, it "is perfectly useless." Attention is directed to the important contribution made by Walras to economic theory when he recognised and formulated the interdependence of economic quantities. M. Zawadzki lends the considerable weight of his authority to the paradox of the Lausanne school, that the entrepreneur works for nothing. He has made the issue clearer; still, we can hardly repeat after him: "We easily see that in a "regime of perfect competition and in a state of equilibrium the "entrepreneur quâ entrepreneur can neither gain nor lose [. . . en "tant qu'entrepreneur ne peut faire ni bénéfice ni perte]." In this connection may be noticed the observation that the case contemplated by Walras was that in which there are no general expenses.

The living leader of the Lausanne school has a place of honour among the theorists who have established the principles of diminishing utility and economic equilibrium. Attention is directed to Professor Pareto's most characteristic doctrines; for instance, the formula for the change in what we might call the marginal utility of money consequent upon the change in the price of a particular commodity (Zawadzki, p. 181); and the suggestion that the significance in respect of value (we are not aiming at precision of terminology) of two commodities may differ with the *order* in which they have been acquired (pp. 150, 176, 195). The latter point is connected with Professor Pareto's theories as to the motives of economic action. Professor Pareto first proposed the term *ophelimity* as a substitute for what English writers used to call "utility," and now, it seems, prefer to call "satisfaction." Later it dawned upon him that ophelimity, too, might be dispensed with. In the words of his faithful interpreter, "we may obtain equations "which suffice to construct the theory of economic equilibrium with- "out employing the notions of utility, ophelimity, &c., by simply con- "sidering the state of indifference in which we have choice between "two courses—the state represented by the so-called 'lines of "'indifference.'" We agree with M. Zawadzki that the difference between this view and that with which it is contrasted is not so great as may appear. For, on the one hand, those who have thought away the existence of a psychical quantity which economic action tends to maximise yet retain the use of mathematical expressions appropriate to such a quantity. "It is convenient to admit the "effectiveness of a psychological principle; in particular (in the "present state of our knowledge) that of the tendency to the greatest "personal gain or ophelimity" (Zawadzki, p. 154 and context). On the other hand, those who proclaim that utility or satisfaction is measurable must admit that the measurement is of a peculiar and hypothetical species—not exactly comparable with "Long Measure" or "Avoirdupoids." As Bishop Berkeley, while denying the existence of *substance* in external bodies, for an example, an orange, yet retains the taste, the fragrance, the beautiful contour and all the attributes of the orange which appeal to our senses and interest us practically; so Professor Pareto retains the doctrine of "maximum ophelimity" as bearing upon practice (Zawadzki, p. 288 and context). Another distinguished foreign economist whom our author has made accessible to a greater number of readers is Professor Barone (p. 292).

With equal impartiality M. Zawadzki has introduced the English mathematical economists to foreign readers. The gentle criticisms with which he tempers appreciative encomium appear to us to deserve attention. The account of English mathematical economists would be more complete and interesting if the latest of them had come under M. Zawadzki's notice in time to be included in his review. A comparison at certain points between the theories of Professor Pareto and of Professor Pigou, made by one who is so deeply imbued as M. Zawadzki with the doctrines of the Lausanne school of economics, could not have failed to prove instructive. Take for example the opening postulate in *Wealth and Welfare*: that (economic) welfare "includes states of consciousness only, "and can be brought under the category of greater and less." How does this trenchant statement compare with the disquisitions on ophelimity and indifference which, though abridged by our author, are still comparatively elaborate? Again, what is the relation between the "maximum satisfaction" of the one economist and the "maximum ophelimity" of the other? According to Professor Pigou, the *maximum* realised by unrestricted competition is not the *greatest possible* satisfaction. We are not likely indeed to gain by an *arbitrary random* departure from that maximum; but we may with advantage go beyond it in some definite directions pointed out by science. So, according to Professor Pareto, to infer that in practice free competition was better than any other economic arrangement would be mere folly (Zawadzki, p. 289). Still, in the absence of specific evidence to the contrary, the result of an ideally free competition would be accepted, we believe, by both writers as an object to be aimed at, a sign-post pointing towards the practically advantageous course. Professor Pigou has thus been guided to recommendations as to the regulation of railways, the importance of which seems to realise our author's most sanguine hopes for the progress of the mathematical method. F.Y.E.

3.—*La Banque en France (considérée principalement au point de vue des trois grandes banques de dépôts).* Par Dr. E. Kaufmann. Translated and brought up to date by A. S. Sacker. vii + 503 pp., 8vo. Paris: M. Giard et E. Brière, 1914. Price 14 francs.

This scholarly German work, written in 1910, has been made available for French readers at a time when it is likely to be of peculiar value to them. The consideration of the whole banking system of France by an extra-parliamentary commission since 1911 is now having issue in legislative proposals for strengthening that system at its weak points and for supplying its deficiencies in order that it may meet the economic needs of the nation as a whole. Dr. Kaufmann's complete review of the system, in its historic development and in the present division of its functions, will be of the greatest assistance to all concerned in solving the practical problems now in hand. The point of view is detached, and the treatment comparative, while there is ample recognition of economic influences in development and of national psychological elements in its characteristic features. Criticism is sound and broad based. Space fails for a résumé even of subject headings; suffice it to say that the introduction skilfully places the whole subject in its historic setting; the first part shows how the functions of banking are divided between the Bank of France, Crédit Foncier, Marché Financier, various kinds of deposit and credit banks, private and co-operative banks, and other organisations for credit; while the second part gives a very detailed account of the history, operations and organisation of the three great banques de dépôts (Crédit Lyonnais, Société Générale and Comptoir Nationale). Particularly interesting to the English reader will be the fiscal, legal and psychological reasons for the comparatively slight development of the cheque system. The advantages and disadvantages of the great concentration of banking are well set out, and the practical problem of supplying personal credit to small traders and adequate long-period credit for medium and small scale industry is very clearly treated. J.C.S.

4.—I. *Der Teilbau nebst der Monographie eines Teilbaugrossbetriebs in Russland aus der Zeit von* 1891–1910. Von E. Jenny. xviii + 346 pp., 8vo. München und Leipzig: Duncker und Humblot, 1913. Price 9 marks. II. *Bauernfrage und Agrarreform in Russland. Unter besonderer Berücksichtigung der nach dem Ukas vom* 9 *November* 1906 *und dem Gesetz vom* 29 *Mai* 1911 *eingeleiteten Auflosung des "Mirs" und Auseinandersetzung der bäuerlichen Landanteile.* Von Dr. K. A. Wieth-Knudsen. vi + 260 pp., 8vo. München und Leipzig: Duncker und Humblot, 1913. Price 8 marks.

Both these books deal with systems of land tenure, the first one with a system found in many countries, and the second with the recent land reforms in Russia.

The subject-matter of *Der Teilbau* is "share-farming," or métayage. The bulk of the book is devoted to a discussion of the nature and extent of this system of land tenure, and its problems and characteristics, while the latter part of the book contains a detailed description of a concrete case in South Russia. The essence of "share-farming," frequently emphasized by the author, is that the landowner and the farmer or cultivator share the *gross* produce according to a pre-arranged scale. The landowner supplies, besides the land, more or less of the capital, implements and stock, and supervision necessary for its working. The farmer, on his side, provides the remainder of the implements and stock, &c., and undertakes the cultivation of the land. The gross produce has to furnish the ground rent, interest on the capital, wages of labour, earnings of management, insurance against risks, and profit, and obviously the share falling to either the landowner or the farmer is open to great variation according, among other things, to the relative contribution of each to the working of the undertaking. The author thinks that the tendency is for the landowner's proportion of the produce to increase.

The system is described in considerable detail. Its history and geographical distribution are briefly traced, its legal and economic bases examined, its "mechanism" described, and its weaknesses and economic and social influences discussed. Finally, as already stated, a detailed study of an undertaking farmed on the share principle in Russia exemplifies the preceding analysis of general principles.

Dr. Wieth-Knudsen's subject is the recent land reforms in Russia, which, the author states, have not hitherto been adequately described in the German or any other European literature. These reforms are really a complement to the Emancipation Decrees of 1858, 1861 and 1866, which gave to the Russian peasantry personal freedom from the bonds of serfdom, but, in conjunction with later laws, practically put the peasants, so far as regards their use of the land, in the control of the *Mir*. The agricultural holdings granted to them after emancipation were generally poor and insufficient, and burdened with debt to the State, which advanced the purchase money. The holdings were, moreover, subject to re-distribution by the *Mir* after certain intervals, and were composed of several scattered strips of land. The object of the recent reforms was to free the peasants from the domination of the *Mir* and secure to them consolidated holdings large enough to provide a fair livelihood. To pave the way for reform and check the discontent of the peasantry, an Imperial manifesto, with effect from January 1, 1907, was issued in November, 1905, releasing the peasants from the further payment to the State of the annuities due in respect of land purchase. In 1906, Land Commissions were appointed to investigate on the spot the conditions of the peasants and facilitate re-distribution and consolidation of holdings. The Peasants' Land Bank was also brought into the scheme of the reforms. This bank was founded in 1882 to advance loans to peasants for the purchase of farms; in 1895 it was allowed to purchase landed estates for re-sale in small lots to peasants; and in 1906, with the cancellation of the peasants' debts to the State, the bank was empowered to advance loans on the security of the peasants' own holdings (*nadiel* land). Thereafter the work of reform was carried on with vigour.

In the final chapter, the author answers some criticisms that have been directed against the reforms. One of the most important of these criticisms is that the establishment of the peasants in large, consolidated holdings, in place of small holdings in scattered strips, may prove but of temporary duration, as the peasants may sub-divide their holdings among their children and thus bring back some, at least, of the old evils. Dr. Wieth-Knudsen does not appear to think that this is very likely, although he considers that some revision of the laws of inheritance in the direction of limiting the alienation and subdivision of the farms may be desirable. He does believe, however, that these land reforms can only meet the needs of the Russian peasants for a time. The land available for holdings in European Russia will become exhausted, and the author sees the ultimate solution in a migratory movement to Siberia and Central Asia.

Both these books deal with highly interesting subjects and may be recommended to anyone desirous of acquiring knowledge of them.

A.D.W.

5.—*Other New Publications.**

Fayle (*C. Ernest*). The New Patriotism. A Study in Social Obligations. ix + 80 pp., 8vo. London: Harrison and Sons, 1914. Price 1*s.* net.

Freeman (*Arnold*). Boy Life and Labour. The Manufacture of Inefficiency. Preface by Dr. M. E. Sadler, C.B. xiii + 252 pp., 8vo. London: P. S. King and Son, 1914. Price 3*s.* 6*d.* net.

[This investigation was undertaken at the request of the Birmingham Education Committee, and is based on an inquiry into the conditions of boy labour in Birmingham. Its special purpose has been to ascertain the causes of the deterioration in character and in earning capacity of the large number of boys who, after leaving school, fail to obtain regular work. The author suggests certain remedies, the essential being a reduction in their working hours and continued compulsory education.]

Gide (*Charles*). Political Economy. Translation from 3rd edition (1913) under the direction of Professor William Smart, by Constance H. M. Archibald. xiii + 762 pp., 8vo. London: G. C. Harrap and Co., 1914. Price 10*s.* 6*d.* net.

Guyot (*Yves*). Where and Why Public Ownership has Failed. Translated from the French by H. F. Baker. ix + 459 pp., 8vo. New York: Macmillan and Co., 1914. Price 6*s.* 6*d.* net.

[This book is a translation of M. Guyot's "La Gestion par l'Etat et les Municipalités" which was reviewed in the *Journal* for February, 1913. For the present edition the facts and figures have been brought up to date.]

Leake (*P. D.*). Goodwill: its nature and how to value it. 24 pp., 8vo. London: Gee and Co., 1914. Price 1*s.* 6*d.* net.

[The author in this interesting paper examines the usual definitions of goodwill and shows their incompleteness in view of modern business developments. He puts forward a new definition, and the necessity for writing off the cost of goodwill is explained at length.]

Liebers (*Dr. Adolf*). Die Finanzen der Städte im Königreich Sachsen. (Ergänzungshefte zum Deutschen Statistischen Zentralblatt. Heft 5.) viii + 176 pp., 8vo. Leipzig, 1914. Price 5*s.*

Loveday (*A.*), B.A. History and Economics of Indian Famines. x + 159 pp., 8vo. London: G. Bell and Sons, Ltd., 1914. Price 2*s.* 6*d.* net.

[The author gives a short history of past famines in India and of the efforts of British and preceding Governments to relieve the sufferers from these calamities, to which India is subject periodically and which may, and do, arise from an excess as well as from a scarcity of rain. The agricultural and industrial changes which have taken place in India during the last century are outlined. Slight use only has been made of statistics, as the accuracy of the older records is open to doubt. The protective measures which have been taken are described, and there is a list of famines and a bibliography.]

Mookosseyev (*V.*). The Russian Money Market. [In Russian.] 59 pp., 8vo. St. Petersburg, 1914.

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* See also "Additions to the Library," page 774, *sqq.*

Mortara (Giorgio)—
Il prodotto dei trasporti di merci sulle linee ferroviarie italiane. 11 pp., 8vo. Rome, 1913.
Numeri indici dello stato e del progresso economico delle Regioni Italiane. 15 pp., 8vo. Rome, 1913.
Numeri indici delle condizioni economiche d'Italia. 14 pp., 8vo. Rome, 1913.
Nuove ricerche sulla mortalità italiana. 15 pp , 8vo. 1914.
Sintomi statistici delle condizioni economiche d'Italia. 30 pp., 8vo. Rome, 1914.
Studi di Semiologia economica. I. Sintomi statistici delle condizioni economiche della Francia. II. Sull' impiego del coefficiente di correlazione nella Semiologia economica. 39 pp., 8vo. Rome, 1914.
[Reprints from recent numbers of the "Giornale degli Economisti."]

Seligman (Edwin R. A.). Essais sur l'Impôt. Tome I. viii + 521 pp. Tome 2. vii + 618 pp. 2 vols., 8vo. Paris: M. Giard and E. Brière, 1914. Price 30 frs. the two vols.

[A translation of the 8th edition of Prof. Seligman's "Essays in Taxation," a review of which appeared in the *Journal* for January last.]

Taussig (F. W.), LL.B. Tariff History of the United States. Sixth edition, revised, with additional material, including a Consideration of the Tariff of 1913. xi + 465 pp., 8vo. London: G. P. Putnam's Sons, 1914. Price 6*s.* net.

[This edition has been brought up to date by the addition of a chapter on the Tariff of 1913, and has been otherwise revised. The author remarks that the Act of 1913 marks the greatest change in the American Tariff since the Civil War. The duties on almost all manufactures have been considerably reduced, wool and sugar are admitted free, and on many articles moderate *ad valorem* duties have been substituted for high specific duties, and it is hoped that eventually this will brace and strengthen the country's industries.]

Tawney (R. H.). Studies in the Minimum Wage No. 1. The Establishment of Minimum Rates in the Chain-making Industry under the Trade Board Acts of 1909. xiii + 157 pp., sm. 8vo. London: G. Bell and Sons, Ltd., 1914. Price 1*s.* 6*d.* net.

[This is the first of a series of reports which it is proposed to issue dealing with recent attempts to establish and enforce a minimum wage. The chain trade was first chosen because it was the first industry for which a Trade Board established minimum rates and because its concentration in a small area makes its investigation relatively easy. Among the conclusions arrived at by the author are the following, viz., that the minimum rates have checked the fluctuations in piece rates and earnings and are likely to smooth out the fluctuations in production, and that there is no reason to suppose that the increase in piece rates has caused unemployment.]

Terry (Schuyler B.). The Financing of the Hundred Years' War, 1337–60. xx + 197 pp., 8vo. London: Constable and Co., Ltd., 1914. Price 6*s.* net.

[An historical account of the difficulties experienced in raising the money necessary for carrying on the war, and of the various expedients by which they were overcome. In an introduction, the sources of the royal income in the 13th century are described, and the history is treated in three periods as follows: Period 1, The competition of the English, Hanse, and Lombard Merchants, 1337–40. Period 2, The English Merchants, 1340–48. Period 3, The effect of the Black Death, 1348–61.]

Withers (*Hartley*). Poverty and Waste. ix + 180 pp., 8vo. London: Smith, Elder and Co., 1914. Price 3*s.* 6*d.* net.

[The author in his short preface says: "It is hard to believe that many who see all the evils of poverty, would live wastefully if they understood how close is the connection between poverty and waste." His endeavour is to make this connection clear.]

The Irish Question. Reprinted from the Round Table of December, 1913. With foreword by the Right Hon. Sir Horace Plunkett. 77 pp., 8vo. London: Macmillan and Co., 1914. Price 6*d.*

France. Évaluation des propriétés non bâties prescrite par l'article 3 de la loi du 31 Décembre 1907. Rapport . . . sur l'ensemble des opérations (3 Novembre 1913). 2 vols., 4to. Paris: Imprimerie Nationale, 1913.

——— Statistique internationale du Mouvement de la Population d'après les Registres de l'état civil. Vol. 2. Années 1901-10. xxxviii + 163 + 298 pp., 8vo. Paris: Imprimerie Nationale, 1913.

——— Enquête sur le travail à domicile dans l'industrie de la chaussure. x + 553 pp., 8vo. Paris: Imprimerie Nationale, 1914. Price 5 francs.

[This report is the third of a series dealing with home industries and relates to the boot and shoe trades. One reason for the choice of this trade as a subject of inquiry was because it employs more men than women, whereas in the two former inquiries the contrary was the case.]

Italy. Bollettino dell' Unione Statistica delle Citta Italiane. Anno 1. N. 1. May, 1914. 8vo. Firenze, 1914.

Spain. Anuario Estadistico de España. Año 1, 1912. 8vo. Madrid, 1913.

Sweden. Svenska Aktuarieföreningens Tidskrift, 1914. Häftet 1. 48 pp., 8vo. Uppsala: Almquist and Wiksell, 1914.

Union of South Africa. Report of Economic Commission, January, 1914. A Summary of Evidence given before Commission and written statements handed to the Commission (excluding confidential evidence and statements) will be published separately. 84 pp., fol. Pretoria: Government Printing Office, 1914. Price 3*s.* 6*d.*

CURRENT NOTES.

The trade returns for the past month cannot be considered satisfactory, both imports and exports showing decreased values, pointing to dullness in business. The subjoined figures compare the twelve months ending May, 1914, with the twelve months ending May, 1913 :—

[000's omitted.]

Imports.	Twelve months ending May, 1914.	Twelve months ending May, 1913.	Increase (+) or Decrease (–).
Imports, value c.i.f.—	£	£	£
I. Food, drink and tobacco	291,225,	285,005,	+ 6,220,
II. Raw materials and articles mainly unmanufactured	276,857,	281,300,	– 4,443,
III. Articles wholly or mainly manufactured..........	194,554,	192,542,	+ 2,012,
IV. Miscellaneous and unclassified (including parcel post)	3,284,	2,996,	+ 288,
Total merchandise	765,920,	761,843,	+ 4,077,
Imports of bullion and specie	73,726.	70,592,	+ 3,134,

[000's omitted.]

Exports.	Twelve months ending May, 1914.	Twelve months ending May, 1913.	Increase (+) or decrease (–).
Exports of produce and manufactures of the United Kingdom, value f.o.b.—	£	£	£
I. Food, drink and tobacco	33,319,	31,675,	+ 1,644,
II. Raw materials and articles wholly unmanufactured	70,472,	66,927,	+ 3.545,
III. Articles wholly or mainly manufactured........	411,020,	402.516.	+ 8,504,
IV. Miscellaneous and unclassified (including parcel post)	11,799,	9,984,	+ 1,815,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	16,606,	15,187,	+ 1,419,
II. Raw materials and articles mainly unmanufactured	64,054,	65,783,	– 1,729,
III. Articles wholly or mainly manufactured	28,791,	29,030,	– 239,
IV. Miscellaneous and unclassified (including parcel post)	132,	156,	– 24,
Total, British, foreign and colonial	636,193,	621,258,	+ 14,935,
Exports of bullion and specie	68,552,	63,275,	+ 5,277,

[000's omitted.]

Shipping.	Twelve months ending May, 1914.	Twelve months ending May, 1913.	Increase (+).
	Tons.	Tons.	Tons.
Total, British and foreign, *entered* with cargoes	49,089,	47,737,	+ 1,352,
Total, British and foreign, *cleared* with cargoes	68,095,	67,065,	+ 1,030,

Mr. Sauerbeck's index-number of prices for May, as given in the *Statist*, is 82·6 as against 82·3 in April, the average of the eleven years, 1867-77, being taken as 100. This small recovery is due to foodstuffs, vegetable food showing an advance of 2·4 per cent., animal food of 1·4 per cent., and sugar, coffee and tea of 2·7 per cent. Minerals, textiles, and sundry materials fell slightly. The index-number of foodstuffs works out at 75·9, against 74·6 in April, and for materials at 87·5, against 88·0 last month. The *Economist* index-number stands at 2,595, as compared with 2,585 in April.

According to the Board of Trade *Labour Gazette*, the state of the labour market last April was as follows:—

	Trade unions making returns. Net membership.	Reported as unemployed.	
		Number.	Percentage.
April, 1914	991,874	20,924	2·1
March, 1914	988,164	21,426	2·2
April, 1913	912,046	15,719	1·7

Employment in April continued good on the whole, and showed little general change from the previous month. The coal mining, engineering and shipbuilding trades were still well employed, but there was some decline in pig-iron, iron and steel, and tinplate manufacture. There was a further seasonal improvement in the building and brickmaking trades. It was reported by the Labour Exchanges that there was a continuance of the demand for labour in the shipbuilding industry. In the building trades there was a scarcity in some districts, and painters were in general demand in the provinces. There was also a deficiency of women in the clothing trades. Compared with a year ago, employment showed a decline, which was especially marked in the pig-iron, iron and steel, and engineering trades. On the other hand, the tinplate trade was much more active than in April, 1913.

The Report [U.G. No. 12, 14. Price 3*s.* 6*d.*] has been issued of the Economic Commission appointed by the Governor-General of the Union of South Africa to inquire into and report upon the following matters, viz.:—(1) Wages, working hours and the cost of living on the the Witwatersrand and other industrial centres within the Union of South Africa; (2) Comparison between wages, working hours and cost of living at such places with those ruling in other countries; (3) Cost of production in the Union compared with that of other countries; (4) The question of establishing a minimum or subsistence wage in any trades or industries within the Union; and (5) The payment for overtime and for night-work in trades or industries within the Union. The Commission, which met under the chairmanship of Professor S. J. Chapman, of the University of Manchester, report that the cost of living for whites (food and rent) on the Witwatersrand is about 40 per cent. higher than in America (the most expensive of the other countries examined) and nearly 80 per cent. higher than in any European country. Other points emphasized in the conclusions of the Commission are as follows:—The chief factor in the high cost of living in South Africa is rent, and another factor of some weight is the high standard of living, particularly on the Witwatersrand. On the other hand, wages on the Witwatersrand are nearly 40 per cent. higher than in America, where money wages are materially greater than in any other country examined, and nearly 225 per cent. higher than in any European country. When allowance is made for the cost of living as a whole it would seem that the workman on the Witwatersrand is better off than the workman in America and much better off than the workman in Europe. Few of the rising generation in South Africa are being apprenticed to the skilled trades, and the training given to apprentices is seldom satisfactory. Attention should be given to this matter, and particularly to the preparation of the youth of the country for supervisory positions, which are relatively numerous and highly remunerated in South Africa. The productivity of the natives could be increased by giving more attention to the organisation of their work, and, where it is possible, adopting more generally the piece-rate system, particularly on the Witwatersrand Gold Mines. The Commission are, further, of opinion that it is undesirable that barriers should be placed in the way of non-white labour by the State or local authorities to prevent their advancement to any kind of work of which they are capable. In regard to a minimum subsistence wage, the Commission consider it undesirable that the Government should lay down any minimum, whether made applicable to whites alone or to all persons regardless of race, but as many white persons are in receipt of low wages some action of a less drastic character should be taken. If satisfactory agreements are to be made and the existing labour unrest is to be allayed, it is essential that employers should recognise trades unions. It is urged, moreover, that, with a view to preventing strikes and lock-outs and settling disputes, voluntary conciliation boards should be established, and additional provisions are recommended.

The Commission make the following specific recommendations to the Government:—

(1) That periodic inquiries should be made by the Statistical Office into the cost of living in different parts of the Union.

(2) That a non-political advisory council to deal with native questions should be instituted.

(3) That an industrial commissioner should be appointed (*a*) to administer any laws that may be passed relating to trades unions and industrial disputes, and (*b*) to deal with the problem of low wages respectively.

(4) That an Act should be passed facilitating the formation of conciliation boards, providing for mediation, and in the last resort, if deemed expedient, for reports on strikes or lock-outs by disputes boards or otherwise.

(5) That an Act should be passed providing for the voluntary registration of trades unions and the protection of non-unionists.

(6) That on and before conciliation boards and representative disputes boards, officials of registered trades unions should be given a status.

(7) That a Factory Act should be passed regulating the hours and conditions of labour.

(8) That the regulations relating to hours in shops should be assimilated to the most comprehensive at present in force.

(9) That by legislative enactment one day's rest in seven should be required for all industrial workers.

(10) That wherever hours are regulated payment for overtime at the rate of time and a quarter at least should be required.

(11) That periodic industrial reports should be made.

(12) That the administration of all industrial and mining legislation should be centralised in one office.

A paper by Dr. M. Greenwood and Mrs. Frances Wood in Vol. VII of the *Proceedings of the Royal Society of Medicine* discusses the important question of the interpretation to be given to changes in the recorded mortality from cancer, whether the increased rates shown by statistics during recent years indicate a real increase of incidence or merely improvement of diagnosis. The question has been raised more than once in the Reports of the Registrar-General and was dealt with in detail by Mr. King and Dr. Newsholme in 1893, the arguments turning generally on the relative apparent increase of cancer in accessible and inaccessible sites; or of the male rate as compared with the female rate, or of the rate in an urban district well supplied with hospitals, where diagnosis may usually be assumed to be good, as compared with the rate in a rural district where it is comparatively poor, and so forth. The present authors reconsider the mean rates of increase of cancer as a whole, in certain urban and rural counties, during the last twenty years (obtaining the increase-rates by fitting straight lines to the curves for index-numbers) and the mean rates of increase similarly obtained for cancer of specified organs. On the whole it is concluded that the hypothesis of improved diagnosis will hardly cover all the facts and that there is some truth in the popular opinion that the real incidence of cancer has increased. The rate of increase is not uniformly greater in the case of inaccessible sites and the position of London is not exceptional. An interesting discussion followed the paper. The same writers have contributed to the *Journal of Hygiene* (April, 1914) a discussion of the relation between the death-rates from cancer and from diabetes. Dr. J. D. Maynard (*Biometrika*, VII) had found for a group of American cities a very high correlation between these rates. Dr. Greenwood and Mrs. Wood, examining statistics from England and Wales, Switzerland and Italy, fail to find any similar relation. At the same time, a detailed study of Dr. Maynard's methods and data fails to reveal any error or source of fallacy, and the origin of the correlation observed by him remains obscure.

An article on "The relative time of fertilization of the ovum "and the sex-ratio amongst Jews," by Dr. Raymond Pearl and Dr. Redcliffe N. Salaman has been reprinted in pamphlet form from the *American Anthropologist*. The authors examine the theory of Thury regarding sex-determination, viz., that ova which are at the time of fertilization over-ripe, or "stale," will give rise to a preponderant number of male young; and they describe an experiment made to test the suggestion that the separation regulations of the Jewish women are the determining cause of the unequal sex-ratio. Statistics are given respecting 57 Jewish families in the East End of London, from which it appears that there is no marked preponderance of male births in these families. The authors, although recognising the inadequacy of the statistical data, conclude (*a*) that there is no evidence that in the human race the time of fertilization of the egg relative to the catamenial period has any influence on the sex-ratio exhibited by the offspring; and (*b*) that the higher male sex-ratio shown by the general Jewish statistics, if not entirely due to faulty registration, must owe its origin to other factors than the time of fertilization of the egg.

Immediately following the Napier Celebration, at Edinburgh, a Mathematical Colloquium will be held on July 28 to 31, under the auspices of the Edinburgh Mathematical Society. The following courses have been arranged for in connection with the Colloquium:—Two lectures on Nomography, by M. d'Ocagne, Professeur à l'École Polytechnique, Paris; four lectures on Infinity in Geometry, by Mr. H. W. Richmond, M.A., F.R.S., Fellow and Lecturer of King's College, Cambridge, and University Lecturer on Mathematics; four lectures on Critical Studies of Modern Electric Theories, by Mr. E. Cunningham, M.A., Fellow and Lecturer of St. John's College, Cambridge; two lectures on The Solution of Algebraic and Transcendental Equations in the Mathematical Laboratory, by Professor E. T. Whittaker, Sc.D., F.R.S., of the University of Edinburgh. Opportunities for social intercourse and recreation will be provided. The fee for the Colloquium is 15*s*. Those who desire to become members of the Colloquium are requested to communicate as soon as possible with Mr. P. Comrie, M.A., B.Sc., 19, Craighouse Terrace, Edinburgh. A remittance of 1*l*. will cover ordinary membership of both the Napier Celebration and the Mathematical Colloquium.

The March issue of the *Quarterly Publications of the American Statistical Association* is devoted mainly to a record of the proceedings at the seventy-fifth anniversary celebration of the Association which included a number of Papers, viz., on the Service of Statistics to Economics, by Dr. David Kinley, of the University of Illinois; to Sociology, by Professor Giddings, of Columbia University; to History, by Professor Charles H. Hull, of Cornell University; and to Biology, by Dr. Raymond Pearl, of the Maine Agricultural Experiment Station.

The death is announced of Dr. Robert Meyer, President of the Imperial and Royal Central Statistical Commission of Austria. Dr. Meyer, who was elected an Honorary Fellow of the Royal Statistical Society in 1911, was formerly Minister of Finance, and held an honorary professorship at the University of Vienna. He was Vice-President of the International Institute, of which he was elected a member in 1905, and Vice-President of the *Staatswissenschaftliche Staatsprüfungs-Kommission.* In addition to being a Privy

Councillor (*geheimer Rat*) at the Court of the Emperor of Austria, Dr. Meyer was a Knight of the Order of the Iron Cross (First Class).

The Society have also to deplore the loss of Dr. Elis Sidenbladh, late Director-in-Chief of the Central Statistical Bureau of Sweden, who was elected an Honorary Fellow in 1890 and a member of the International Statistical Institute in 1885. Dr. Sidenbladh, who died on May 13, at the age of 78, was formerly President of the Royal Statistical Commission and was a Commander, Officer and Knight of several Swedish and Foreign Orders. He was a member of the Royal Academies of Science and Agriculture at Stockholm, and Honorary and Corresponding Member of several foreign learned Societies. Both Dr. Meyer and Dr. Sidenbladh were donors to the Library of the Royal Statistical Society.

It is announced that Dr. John Brownlee, Physician of Ruchill Hospital, near Glasgow, has resigned the position, consequent on his appointment under the Government Medical Research Committee as medical statistician.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Bankers' Magazine. June, 1914—The Budget. Progress of banking in Great Britain and Ireland during 1913. No. 5. Proportion of capital and reserve to deposits. Banking in Denmark—an historical sketch.

Faculty of Actuaries (Transactions). Vol. VII, Part II, No. 64—Female mortality: *Fyfe (Austyn J. C.).*

Financial Review of Reviews. June, 1914—Investment safeguards under changing conditions: *Hobson (J. A.).* Panama problems and possibilities: *Good (T.).*

Journal of the Board of Agriculture. May, 1914—Continental horse traffic. Notes on agricultural co-operation and small holdings.

Journal of the Institute of Bankers. June, 1914—Gold reserves: *Jackson (The Right Hon. F. H.).*

UNITED STATES—

American Journal of Sociology. May, 1914—The social gradations of capital; *Small (Albion W.).* Functional industrial relationships and the wage-rate: *Vogt (Paul L.).*

American Statistical Association (Quarterly Publications). No. 105. *March*, 1914—The seventy-fifth anniversary celebration of the American Statistical Association. The service of statistics to economics: *Kinley (David).* The service of statistics to sociology: *Giddings (Franklin H.).* The service of statistics to history: *Hull (Charles H.).* The service and importance of statistics to biology: *Pearl (Raymond).* The technique of public statistical exhibits: *Storey (Charles J.).* The influence of marriage on the death-rate of men and women: *Bliss (George I.).* The need of a federal trade census: *Copeland (Melvin T.).* The number of Jews in New York City: *Chalmers (Henry).*

Journal of Political Economy. May, 1914—The Banking and Currency Act of 1913: *Laughlin (J. Laurence).* Commercial paper and the federal reserve banks: *Sprague (O. M. W.).* The probable effects of the new Currency Act on bank investments: *Hollander (Jacob N.).* The elasticity of note issue under the new currency law: *Taylor (F. M.).* Trade unionism in the United States: the interpretation of union types: *Hoxie (Robert F.).*

UNITED STATES—*Contd.*

Quarterly Journal of Economics. May, 1914—The trust problem. I. The necessity of prohibition or regulation. II. The possibility of preventing combination: *Durand (E. Dana).* Davenport's economics and the present problems of theory: *Johnson (Alvin S.).* Fire insurance rates and State regulation: *Gephart (W. F.).* Rent under the assumption of exhaustibility: *Gray (L. C.).* Home rule in taxation: *Secrist (Horace).* The literature of scientific management: *Thompson (C. Bertrand).* Public ownership of telegraphs and telephones: *Holcombe (A. N.).* The development of Alaska by Government railroads: *Brooks (Alfred H.).*

AUSTRIA—

Statistische Monatschrift. 1914—

February-March—Geburten und Sterbefälle in den grösseren Städten Österreichs im Jahrzehnt 1901-10 und in den Jahren 1910, 1911, 1912 (*continued in next issue April*, 1914): *Drexel (Dr. Karl).* Rückblick auf das Jahr 1913. Studentenstiftungen im Jahre 1912: *Eberstaller (Dr. Theodor).*

April—Über die Erhebungsmethoden des amerikanischen Census: *Sorer (Dr.).* Der auswärtige Warenverkehr Bosniens und der Herzegowina im Jahre 1911 im Vergleiche mit den Jahren 1910 und 1907: *Korompay (Dr. A.).* Die Frauen unter der Bevölkerung der Vereinigten Staaten und den Einwanderern: *Hecke (Dr.).* Zur Frage der Berechnung von Totalindices in der Semiologie: *Bernheimer (Erich).*

CUBA—

La Reforma Social. May, 1914—El Homestead: *Comallonga (José).* El problema social en la Argentina: *Garibaldi (Manuel).*

FRANCE—

Bulletin de Statistique, Ministère des Finances. April, 1914—Établissement d'une statistique commerciale internationale. Les produits de l'enregistrement, des domaines et du timbre constatés et recouvrés, en France, pendant l'exercice 1912.

Journal des Economistes. May, 1914—L'Entente cordiale au point de vue économique: *Guyot (Yves).* Crises monétaires mondiales: *Wolff (Robert).* Une solution libérale en matière de prévoyance sociale: *Bellom (Maurice).* L'Emprunt turc: *Guyot (Yves).* L'alimentation de l'Angleterre et les denrées frigorifiées: *Gouault (E.).* Les assemblées générales des compagnies de chemins de fer: *Nouvion (Georges de).* Mouvement agricole: *Molinari (Maurice de).*

Journal de la Société de Statistique de Paris. May, 1914—Population et populations de l'Algérie: *Meuriot (Paul).*

La Réforme Sociale. May 16, 1914—La crise médico-mutualiste. Son historique, ses causes, ses moyens de solution: *Vermont (H.).* L'enfance malheureuse en France.—L'enfance abandonnée: *de Witt-Guizot (François).*

GERMANY—

Deutsches Statistisches Zentralblatt. May, 1914—Erkenntnistheorie und Statistik: *Günther* (*Dr.*).

Jahrbuch für Gesetzgebung, Verwaltung und Volkswirtschaft (*Schmoller's*). *Heft* 2, 1914—Die Tatsachen der Lohnbewegung in Geschichte und Gegenwart: *Schmoller* (*Gustav*). Die Stellung der Werturteile in der Nationalökonomie: *Spranger* (*Eduard*). "Die berufliche und soziale Gliederung des deutschen Volkes" nach der Berufszählung vom 12. Juni 1907: *Kollmann* (*Paul*). Die österreichische Volkszählung vom 31. Dezember 1910: *Martini* (*Paul*). Deutsch-französische Wirtschaftsbeziehungen zur napoleonischen Zeit: *Tarle* (*Eugen*). Die Genossenschaft Deutscher Bühnen-Angehöriger und ihre wirtschaftliche Bedeutung für das Theater: *Spuhl* (*Rudolf*). Das Problem der öffentlichen Arbeitslosenversicherung nach seinem gegenwärtigen Stande: *Bernhard* (*Ernst*). Die neueren Agrarreformen und die Pachtgenossenschaften in Rumänien: *Maltezianu* (*Constantin*). Der Kampf um das Petroleum: *Schneider* (*Oswald*). Aus hundert Jahren deutscher Eisen- und Stahlindustrie: *Keibel* (*Rudolf*). Die Ergebnisse des zweiten deutschen Soziologentages: *Kohler* (*Walther*).

Jahrbücher fur Nationalökonomie und Statistik (*Conrad's*). *May*, 1914—Die Reichsbesitzsteuer: *Strutz* (*G.*). Rindereinfuhr in den deutschen Territorien, insbesondere in Hessen im 16 und 17 Jahrhundert: *Schultze* (*Joh.*). Die neuesten Erfahrungen mit der Arbeitslosenversicherung: *Feig* (*Johannes*). Die Geldkrise in Oesterreich-Ungarn: *Dub* (*Moriz*). Die Entwicklung der Kriminalität im Deutschen Reich 1882-1910: *Krüger* (*Kurt*). Bevölkerungsentwicklung der Vororte von Berlin, London und Paris seit 1801: *Müller* (*Johannes*). Die Elektrizitätsmonopole in Gemeinden und Kommunalverbänden, ihre rechtliche Grundlage und deren Aenderung: *Szczesny* (*Victor*).

Vierteljahrshefte zur Statistik des Deutschen Reichs. Heft 1. 1914—Anordnungen für die Reichsstatistik 1913. Krankenversicherung (1908-12). Erntestatistik für das Jahr 1913. Zulassung von Wertpapieren an den deutschen Börsen 1913. Die Bestands- und Kapitaländerungen der deutschen Aktiengesellschaften (einschl. Kommanditgesellschaften auf Aktien) (1913). Die Bestands- und Kapitaländerungen der deutschen Gesellschaften m.b. H. (1913). Die Selbstmorde (1893 bis 1912). Reichserbschaftssteuerstatistik 1912. Die Zählung der Kraftfahrzeuge am 1. Januar 1914. Produktion der Kohlen-, Eisen- u. Hüttenindustrie im Jahre 1912.

Zeitschrift fur die gesamte Staatswissenschaft. Heft 2, 1914—Betrachtungen über die Kompetenzverteilung in den modernen Staaten: *Beyer* (*Bruno*). Zur Geschichte des Bergrechts von der ältesten Zeit bis auf die Gegenwart: *Arndt* (*Adolf*). Der Kampf um die Arbeitsleistung in Australien und Amerika: *Junghann*, Gesindegerichte: *Müller* (*Georg*). Die Zeitungspolitik der deutschen Stadtverwaltungen: *Berthold* (*Willy*).

GERMANY—*Contd.*

Zeitschrift für die gesamte Staatswissenschaft. Heft 2—Contd. Fehlerquellen in der Statistik der Nationalitäten: *Mitscherlich (Waldemar).* Die Wirksamkeit des britischen Arbeitslosenversicherungsgesetzes: *Fehlinger (H.).*

ITALY—

Giornale degli Economisti e Rivista di statistica. May, 1914—Indici economici. Del rischio: *Insolera (F.).* Lo sviluppo di Catania: *Inclimona (Ettore).* Osservazioni critiche sul "metodo del Wolf" per lo studio della distribuzione dei redditi: *Bresciani-Turroni (C.).* Il frumento in Italia: *Pietra (G.).* Un censimento di Roma avanti il sacco borbonico. (Saggio di demografia storica): *Livi (Livio).*

La Riforma Sociale. May, 1914—Per una riforma nella tassazione dell' energia elettrica: *Norsa (Renzo).* I prezzi delli merci in Italia nel 1912: *Necco (Achille).* Industrie pubbliche ed industrie private in una inchiesta ufficiale prussiana: *Geisser (Alberto).* L' Industria del granito nel canton Ticino: *Necco (Achille)* Un capitolo della vita di Giovanni Law: *Ruffini (F.)* and *Einaudi (L.).* La finanza della guerra e delle opere pubbliche: *Einaudi (Luigi).*

Rivista Critica di Scienze Sociali. May, 1914—Profili di economisti moderni: Gino Borgalla: *Alberti (Mario).*

MONTHLY LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since May 8, 1914, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Austria—

Kataster der Gewerbegenossenschaften und deren Verbände in Mähren und Schlesien. Abteilung 1. Band 7. 8vo. 1914. (K.K. Handelsministerium.)

France—

Statistique internationale du Mouvement de la Population d'après les Registres de l'état civil. Vol. 2. Années 1901–10. 8vo. 1913. (The General Statistical Department.)

Germany—

Dusseldorf. Zur wirtschaftlichen und Sozialen Entwicklung Düsseldorfs im Jahre 1913. 4to. 1914. (The Statistical Bureau.)

Verein für Sozialpolitik—

Die Milchversorgung in Württemberg. Von Dr. Otto Trüdinger. 8vo. 1914. (Purchased.)

Preisbewegung landwirtschaftlicher Güter in einigen Teilen Bayerns während der Jahre 1900 bis 1910. Mit Beiträgen von Michael Horlacher, Franz Hörenz, Jörgen Hansen, V. J. Fröhlich und einer Einleitung von Lujo Brentano. Mit zwei Karten. 8vo. 1914. (*Id.*)

Hungary—

Agriculture. World's Crop of Corn and other main Agricultural Produces in 1913. No. 2. 1914. 8vo. 1914. (The Royal Hungarian Minister of Agriculture.)

Births, &c. Mouvement de la Population de 1901 à 1910, par Communes. (In Hungarian.) 8vo. 1913. (The Central Statistical Office.)

Education. Développement de l'Instruction Primaire. (In Hungarian.) 8vo. 1913. (*Id.*)

Livestock. Effectif des Animaux d'après la Situation au 28 Février 1911. (In Hungarian.) 8vo. 1913. (*Id.*)

Italy—

Annali di Statistica. Serie V. Vol. 7. Tavola di mortalità secondo le cause di morte, per la popolazione italiana (1909–10): *G. Mortara*. 81 pp., 8vo. Rome, 1914. (The Director-General of Statistics.)

Bollettino dell' Unione Statistica delle Citta Italiane. Anno 1. N. 1. May, 1914. 8vo. Firenze, 1914. (The Union.)

Netherlands—

Statistique de l'application des lois pour la protection de l'enfant; année 1912 4to. 1914. (The Central Statistical Bureau.)

Paraguay—

Mensaje del Presidente al inaugurar las sesiones del xliv periodo legislativo, 1914. 8vo. 1914. (The Director-General of Statistics.)

Russia—

Explanatory Memorandum of Minister of Finance to Draft Budget for 1914. Part 2. La. 8vo. 1914. (The Commercial Agent of the Russian Government.)

(a) Foreign Countries—*Contd.*

Spain—

Anuario Estadistico de España. Año 1, 1912. 8vo. 1913. (The Director-General of Geographical and Statistical Institute.)

Births, &c. Movimiento natural de la Poblacion de España, Año 1907. 8vo. 1913. (*Id.*)

Emigration. Estadistica de la Emigracion é Inmigracion de España, 1909, 1910 y 1911. 8vo. 1912. (*Id.*)

Press. Estadistica de la Prensa periodica de España referida al 1. Abril, 1913. Fol. 1914. (*Id.*)

Sweden—

Housing. Socialstatistik. Byggnadsverksamheten i Rikets Stadssamhällen, år 1912. 8vo. 1914. (K. Socialstyrelsen.)

Svenska Aktuarieföreningens Tidskrift. 1914. Haftet 1. 48 pp., 8vo. Uppsala, 1914. (The Editor.)

United States—

Census Bureau. Bulletin 118. Financial Statistics of Cities having a Population of over 30,000: 1912. Bulletin 119. Insane and Feeble-Minded in Institutions, 1910. Bulletin 120. Paupers in Almshouses, 1910. Bulletin 121. Prisoners and Juvenile Delinquents, 1910. 4 parts, 4to. 1914. (The Bureau.)

Bulletin of Bureau of Labor Statistics. Whole Number 137. Wages and Hours of Labor in the Building and Repairing of Steam Railroad Cars: 1890 to 1912. Whole Number 140. Retail Prices, 1890 to December, 1913. 2 parts, 8vo. 1914. (The Bureau.)

New York. Historic Buildings now standing in New York which were erected prior to 1800. 45 pp., 8vo. 1914. (The Bank of the Manhattan Company.)

(b) India and Colonies.

India—

East India (Census). General Report of the Census of India, 1911. [Cd-7377.] 1914. (Sir H. Verney.)

Calcutta. Report of Committee as to Existing Facilities and Present and Future Requirements of the Port of Calcutta. Vol. 2. Appendices and map. Fol. 1914. (The Committee.)

Canada—

Census. Bulletin 19. School Attendance of Population aged 5 to 24 for 1910 as enumerated June 1, 1911. 8vo. 1914. (The Census and Statistical Office.)

Union of South Africa—

Report of Economic Commission, January, 1914. A Summary of Evidence given before Commission and written statements handed to the Commission (excluding confidential evidence and statements) will be published separately. 84 pp., fol. Pretoria, 1914. (Prof. S. J. Chapman.)

(c) United Kingdom and its several Divisions.

United Kingdom—

Fisheries. Report of Departmental Committee on Inshore Fisheries. Vols. 1 and 2. [Cd-7373 and 7374.] 1914. (Sir H. Verney.)

England and Wales—

Census of England and Wales, 1911. Vol. IX. Birthplaces of Persons Enumerated in Administrative Counties, County Boroughs, &c., and Ages and Occupations of Foreigners. [Cd-7017.] 1913. (The Census Office.)

London County Council. Rate collection (leakages), 1912-13. 12 pp., 8vo. 1914. (Purchased.)

(c) **United Kingdom and its Several Divisions**—*Contd.*

Scotland—

Land. Report by Scottish Land Court . . . for 1913. [Cd-7398.] 1914. (Sir H. Verney.)

(d) Authors, &c.

Angelescu (*Dr. I. N.*)—

L'Evolution du Commerce extérieur de la Roumanie. 35 pp., 8vo. Bucarest, 1914. (The Author.)

Le Mouvement coopératif en Roumanie. 24 pp., 8vo. Bucarest, 1914. (*Id.*)

Antonelli (*E.*). Principes d'Économie Pure. La Théorie de l'Échange sous le Régime de la Libre Concurrence. Préface de G. Renard. ix + 206 pp., 8vo. Paris, 1914. (Marcel Rivière and Co.)

Arctowski (*Henryk*)—

Climatic Changes recorded in New York City. 15 pp., 8vo. 1913. (The Author.)

Studies on Climate and Crops. Corn Crops in the United States. 16 pp., 8vo. 1913. (*Id.*)

Aubry (*Pierre*). Le Problème de la Dépopulation. 20 pp., 8vo. 1913. (*Id.*)

Bilgram (*Hugo*) and *Levy* (*Louis Edward*). The Cause of Business Depressions, as disclosed by an Analysis of the Basic Principles of Economics. xvi + 530 pp., 8vo. London, 1914 (J. B. Lippincott and Co.)

Borel (*Émile*). Le Hasard. 2nd Edition. (Nouvelle Collection scientifique.) iv + 311 pp., sm. 8vo. Paris, 1914 (Félix Alcan.)

Cook (*Lady*)—

A discourse on the true meaning of the Bible. 12 pp., 8vo. 1912. (The Authoress.)

The need of revising morals and laws. 16 pp., 8vo. 1910. (*Id.*)

Elderton (*W. Palin*) and *Fippard* (*Richard C.*). The Construction of Mortality and Sickness Tables. A Primer. vi + 120 pp., sm. 8vo. 1914. (A. and C. Black.)

Engledow (*F. L.*), B.A., and *Yule* (*G. Udny*), M.A. The Determination of the Best Value of the Coupling-Ratio from a Given Set of Data. 5 pp., 8vo. 1914. (Mr. G. Udny Yule.)

Fayle (*C. Ernest*). A New Patriotism. A Study in Social Obligations. ix + 80 pp., 8vo. 1914. (The Garton Foundation.)

Freeman (*Arnold*). Boy Life and Labour. The Manufacture of Inefficiency. Preface by Dr. M. E. Sadler, C.B. xiii + 252 pp, 8vo. London, 1914. (P. S. King and Son.)

Gide (*Charles*). Political Economy. Translation from 3rd edition (1913) under the direction of Professor William Smart, by Constance H. M. Archibald. xiii + 762 pp., 8vo. London, 1914. (G. C. Harrap and Co.)

Greenwood (*M.*), Jun., and *Wood* (*Frances*)—

The relation between the Cancer and Diabetes Death-rates. 35 pp., 8vo. Cambridge, 1914. (The Authors.)

On changes in the recorded Mortality from Cancer and their possible interpretation. 52 pp., 8vo. London, 1914. (*Id.*)

Hobson (*C. K.*), M.A. The Export of Capital. xxv + 264 pp., 8vo. London, 1914. (Constable and Co.)

Hoffman (*Frederick L.*). The Menace of Cancer. (Reprinted from Transactions of American Gynecological Society, 1913.) 56 pp., 8vo. 1913. (The Author.)

Ireland. The Irish Question. Reprinted from the Round Table of December, 1913.) With foreword by the Right Hon. Sir Horace Plunkett. 77 pp., 8vo. 1914. (The Round Table.)

Leake, (*P. D.*). Goodwill: its nature and how to value it. 24 pp., 8vo. London, 1914. (The Author.)

Liebers (*Dr. Adolf*). Die Finanzen der Städte im Königreich Sachsen. (Ergänzungshefte zum Deutschen Statistischen Zentralblatt. Heft 5.) viii + 176 pp., 8vo. Leipzig, 1914. (Purchased)

Loveday (*A.*), B.A. History and Economics of Indian Famines. x + 159 pp., 8vo. London, 1914. (G. Bell and Sons, Ltd.)

Vol. LXXVII.] [Part VIII.

JOURNAL

OF THE ROYAL STATISTICAL SOCIETY.

JULY, 1914.

THE ECONOMIC RELATIONS OF THE BRITISH AND GERMAN EMPIRES.

By EDGAR CRAMMOND.

[Read before the Royal Statistical Society, June 16, 1914,
the President, Professor F. Y. EDGEWORTH, M.A., F.B.A., in the Chair.]

The British and German Empires together transact approximately 39 per cent. of the international trade of the world (in 1911 the British Empire's share was 26·9 per cent. and German Empire's share was 12·5 per cent.), they own 53 per cent. of the merchant shipping of the world, and their credit institutions play an enormous and indispensable part in the conduct of the trade of the world. It is inevitable, therefore, that the commercial and financial relations of the two Empires should be of vast magnitude, both directly and indirectly.

Ever since the interchange of commodities between Great Britain and Europe became practicable, our trading and commercial relations with Germany have been of growing magnitude. About sixty years ago Englishmen and Scotsmen played an important part in the industrial development of Germany, and a considerable amount of British capital was invested in German tramways, gas-works, waterworks, cotton mills, &c. At that time we sold manufactured goods to Germany and took in exchange corn, wool and cattle. With the economic development of Germany the character of her international trade has undergone a complete transformation, but notwithstanding the changing character of Germany's exports and imports the volume of the trade between the two Empires is constantly increasing.

It would occupy too much time to trace out here the growth and changing character of Anglo-German trade during the past century; moreover, it will amply suffice for our present purpose if we survey the economic development of Germany and the development of Anglo-German trade during the past twenty-five years. This period is a peculiarly suitable one to adopt as His Imperial Majesty the Kaiser ascended the throne in 1888. In certain cases, where it has appeared to be desirable to do so, I have included statistics relating to the year 1873, when the economic disturbances created by the Franco-German war had to some extent subsided. In other instances I have been compelled, owing to the eccentricities of our official trade returns, to adopt other years for comparative purposes.

In the main my figures have been taken from our own official publications, but I have also used freely the information supplied in the *Statistisches Jahrbuch.* I am also greatly indebted to certain of the great German banks for information which they have supplied from their Statistical Departments.

In most of the statistics, the German mark has been taken as equivalent to one shilling.

It is important to bear in mind the fact that exports of ships have only been included in our trade returns since 1899.

It must also be remembered that in the case of Germany, the area covered by the trade returns has varied considerably since 1888. Bremen and the greater part of the town of Hamburg were not included in the Customs Union until 1899. From March 1, 1906, the statistics refer to the Economic Union, which includes the free ports of Hamburg, Cuxhaven, Bremerhaven and Geestemunde.

Special imports are imports for home consumption.

Special exports are exports of domestic produce.

In order to appreciate the nature and magnitude of the direct and indirect economic relations that exist between the two Empires, it is necessary to consider at some length certain fundamental data with regard to their population, foreign trade, shipping, railways, national wealth, &c. The late Sir Robert Giffen has emphasised the dangers which attend the formulation of international statistical comparisons, but the improvements that have taken place in the preparation of statistics and the close approximation that now exists between the economic condition of Germany and that which obtains in Great Britain, have removed many of the obstacles and dangers which Sir Robert Giffin had in mind in 1892.

Dealing first with the question of population, in 1873 the British birth rate was 34·1 per 1,000 as compared with 40·3 in Germany. From that date onwards the rate declined rapidly in both countries, and in 1911 the British rate was 24·4 as compared with 29·5 in

Germany. It is worthy of notice that the decline of the birth-rate in Berlin and other large German cities has reached proportions which seriously alarm many German economists. On the other hand, there has been a notable decline in the death-rate in both Germany and the United Kingdom. In 1873 the German rate was 26·7 per 1.000 and the British rate was 21·3, and in 1911 the ratios fell respectively to 18·2 and 14·8. In 1873 the excess of births over deaths was in Germany 474,000 and in the United Kingdom 427,000. In 1911 Germany had an excess of births over deaths of 740,000, while in the same year the excess of births in the United Kingdom was only 433,000.

Between 1861 and 1911 the net loss of the United Kingdom by migration was 4,188,000. Between 1871 and 1905 Germany's net loss by migration amounted to 2,313,000.

Population. [Cd–4954.]

Year.	Germany.		United Kingdom.
1872	41,230,000	—	31,874,000
'88	48,168,000	—	36,881,000
1910 Census	64,925,000	1911 Census	45,216,000
Increase between 1872 and 1910	23,695,000	Increase between 1872 and 1911	13,342,000

Number of births.

Year.	Germany.	Rate per 1,000.	United Kingdom.	Rate per 1,000.
1873	1,648,000	40·3*	1,091,000	34·1*
'88	1,761,000	37·1*	1,112,000	30·8*
1911	1,927,000	29·5	1,105,000	24·4

* Averages are for quinquennial periods.

Number of deaths.

Year.	Germany.	Rate per 1,000.	United Kingdom.	Rate per 1,000.
1873	1,174,000	26·7*	666,914	21·3*
'88	1,142,000	24·9*	668,000	18·7*
1911	1,187,000	18·2	672,000	14·8

* Averages are for quinquennial periods.

Excess of births over deaths.

Year.	Germany.	United Kingdom.
1873	474,000	427,000
'88	618,000	444,000
1911	740,000	433,000

In 1861 the urban population* of the United Kingdom was 47·3 of the total population.

In 1901 the urban population* of the United Kingdom was 71·3 per cent. of the total.

In 1871 the urban population* of Germany was 36·1 per cent. of the total.
In 1905 „ „ 57·4 „

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* The definition of what constitutes urban population differs in the two countries.

Although the transformation of Germany from an agricultural to a manufacturing country is proceeding at a rapid pace, agriculture is still by far the largest of her industries. In 1882 8,236,500 persons were employed in agriculture and forestry, and with their dependents they numbered 19,225,000, or 42 per cent. of the entire population. In 1907 they numbered 9,883,300, and including their dependents 17,681,000, or 28·5 of the total population. Concurrently with the growth of Germany's manufacturing industries there has been a vast migration from the country to the towns. In 1885, 8,600,000 or 18·4 per cent. of the whole population resided in cities having more than 20,000 inhabitants, in 1910 they numbered 22,400,000, or 34·5 per cent. of the entire population. German statesmen and economists have recognised the disadvantages and dangers that attend this shifting of the centre of gravity of the population from the country to the towns, and to these considerations in a measure must be ascribed the special consideration that has been extended to agriculture in Germany.

As Sir Francis Oppenheimer pointed out in his Consular Report for 1909, "Among all things protected in Germany agriculture is "the most highly protected. Moreover, the agricultural classes "enjoy a variety of special privileges, *e.g.*, in connection with "taxation, the carriage of goods by rail, &c., and enjoy them at "the final expenses of the non-agrarian part of the community. "The increased duty rate has artificially raised the value of "agricultural land by increasing its revenue (in the sitting of the "Imperial Diet of June 23, 1909, one of the members estimated "such increased value at 1,000,000,000*l*.) . . ." The Report of the Chamber of Commerce, Mannheim (1908), states that the legislative favours enjoyed by German agriculture in the shape of customs, reductions of and alleviation from taxation, &c., amount to over 50,000,000*l*. per annum.

It cannot be maintained, however, that protection has resulted in the stagnation of German agriculture, or that German agriculturists have been content to stand merely on the defensive behind her tariff wall. On the contrary, by a marvellous system of intensive cultivation Germany maintains her position as one of the principal agricultural countries of the world. In respect of the yield per hectare, she stands seventh for wheat, third for barley and oats, fourth for rye, and fifth for potatoes. So far as total output is concerned, Germany, owing to her large acreage, occupies a high position. She holds the third place in the production of wheat and rye, while Russia has a long lead. In barley Germany holds the third place, and in potatoes she is far ahead of all other countries. There are no authentic estimates as to the value of the total agricultural production of Germany, but one of the Central Boards of Agriculture has formulated the following estimates as to the value of certain agricultural products for the year 1912, namely:—

	£
Wheat and rye	140,000,000
Cattle, pigs, &c.....	200,000,000
Milk	137,500,000
	477,500,000

Notwithstanding the developments of the past forty years, German agriculture cannot satisfy the home demand for the leading food stuffs, and there is a steady increase in the import of wheat, maize, barley, bran, oats, as well as dairy produce such as cream, butter, eggs, poultry, &c. In the matter of meat and cattle for slaughtering, the demand would be even greater if the import were not subjected to irksome conditions. In 1887 the value of foods, beverages, animals, &c., imported into Germany amounted to 48,275,000*l*. In 1912 these classes of imports were valued at 160,030,000*l*.

Agriculture is still one of our most important industries and it gives direct employment to a larger number of persons than any other industry. The following is a statement of the number of persons engaged in agriculture as returned at each census 1871-1911:—

Year.	England and Wales.	Scotland.	Ireland.	United Kingdom.
1871	1,298,416	239,889	949,595	2,487,900
'81	1,189,315	221,139	967,737	2,378,191
'91	1,089,809	192,186	911,944	2,193,939
1901	957,194	178,846	847,411	1,983,451
'11	1,004,980	170,174	751,533	1,926,687

The annual sale of produce from the farms of the United Kingdom as ascertained in the special enquiries made by the Board of Agriculture and the Irish Department in 1908 was as follows:—

	£
England and Wales	127,650,000
Scotland....	23,150,000
Ireland	38,346,900
Total	189,146,900

It will be recalled that in the course of a paper on the Nation's Food Supply which he read before the British Association in 1912, Mr. Rew stated that it might be said that the United Kingdom produced rather more than one half of its total food requirements exclusive of sugar and the beverages which may be regarded as the necessaries of civilised life.

The agricultural policy of the United Kingdom has been the opposite of that pursued by Germany, and it is interesting to note that while in the case of Germany the special consideration extended to agriculture has resulted in a vast appreciation in the value of rural land (as stated above, one estimate of the appreciation in value amounted to 1,000,000,000*l.*), the agricultural policy of Great Britain has resulted in a very great depreciation in the value of agricultural land. In a Paper which he read before this Society in 1905, Sir R. H. Inglis Palgrave estimated the losses of agriculture in the United Kingdom between the years 1872–1907 and 1904 at 1,600,000,000*l.*

The industries of Germany, like those of Great Britain, are based mainly upon coal and iron, both of which minerals exist in great quantities within the Empire. Germany also possesses considerable supplies of other important minerals, especially salts, and zinc, lead and copper ores. During the past twenty-five years the value of the mineral production of Germany increased from about 35,000,000*l.* to 102,000,000*l.* In 1911 the mineral production of the United Kingdom was valued at 124,500,000*l.*

Germany now occupies the third place among the coal-producing countries of the world. The output of the three principal countries in 1886 and 1911 respectively is shown hereunder :—

Output of coal (including lignite).

Year.	United States.	United Kingdom.	Germany.
	Tons.	Tons.	Tons.
1911	450,200,000	276,200,000	234,500,000
1886	103,100,000	160,000,000	73,700,000
Increase	347,100,000	116,200,000	160,800,000
Increase per cent.	336·6	72·6	218·1

It will be noted that during the period named Germany's ratio of increase was three times as large as that of the United Kingdom. It must be remembered, however, that the German total for 1911 included 74,000,000 tons of lignite. The actual output of coal for the two countries in that year was as follows :—United Kingdom, 276,000,000 tons ; Germany, 160,500,000 tons.

The expansion of Germany's iron industry deserves attention. In 1887 the total production was 4,024,000 tons ; in 1911 it amounted to 15,574,000 tons ; an increase of 287 per cent. During the same period, the production of Great Britain advanced from 7,681,000 tons to 10,033,000 tons ; an increase of only 30·6 per cent. In 1887 we held the first position, we are now a bad third.

In steel production the advance of Germany has been still more marked. The following table shows the output of crude steel by the three principal countries in 1886 and 1910 respectively :—

Year.	United States.	United Kingdom.	Germany.
	Tons.	Tons.	Tons.
1910	26,512,400	6,106,800	13,698,600
1886	2,604,400	2,403,200	954,600
Increase	23,908,000	3,703,600	12,744,000
Increase per cent.	910·3	154·1	1,335

Here Germany's ratio of increase was more than eight times as great as that of the United Kingdom.

It is interesting to note that the development of the cotton industry of Germany has been comparatively slow in relation to that of the United Kingdom. In 1888 the number of spindles employed in Germany was 5,100,000, and in 1909 they numbered 10,163,000, an increase during the twenty-one years of 5,063,000 spindles. Within the same period the number of spindles employed in the Lancashire cotton industry increased from 42,740,000 to 55,600,000, an advance of 12,860,000 spindles. That is to say, in twenty-one years (1888-1909) the number of spindles employed in the Lancashire cotton industry increased to a greater extent than the total number of spindles in operation in Germany in 1909. It is interesting to note, however, that in 1913 the number of new spindles in Germany greatly exceeded the number of new spindles in Lancashire.

In 1887 the exports of German cotton goods were valued at 10,000,000*l.*; in 1912 the exports were valued at 24,285,000*l.*; an increase of 14,285,000*l.* In 1888 the exports of cotton manufacture from the United Kingdom were valued at 72,000,000*l.*, and in 1912 the exports were valued at 122,220,000*l.*, an increase of 50,220,000*l.* No doubt, within the period named, the home market in Germany expanded to a much greater extent than that of the United Kingdom; but, making every allowance for this expansion, it is obvious that the British cotton industry has much more than held its own in relation to that of Germany.

It is also curious to note the comparatively slow growth of the woollen industry of Germany. In 1888 the exports were valued at 12,700,000*l.*, and in 1912 they had only advanced to 16,880,000*l.* In the case of the United Kingdom, the exports for 1888 were valued at 20,000,000*l.*, and in 1912 they were valued at 37,773,000*l.* Here, again, it will be observed that the British industry has expanded much more rapidly than that of Germany.

There has been a wonderful development of banking in Germany since the early 'seventies. Although there still exist over 3,000 bankers in Germany, the bulk of the business lies in the hands of the joint stock banks. There is a fundamental difference between the methods of banking business in this country and Germany. The German banks are far more enterprising than ours, and their policy in combining a loan and finance business has undoubtedly fostered the development of the great industrial joint stock companies in Germany. The directors of one of the great banks alone are on the boards of at least 200 joint stock companies. In 1912 the deposits of the German credit banks amounted to 468,000,000*l.* This total is less than one-half of the deposits of the joint stock banks of the United Kingdom and the Bank of England, which, at the beginning of 1913, stood at 1,053,000,000*l.*

German economists always lay stress upon the magnitude of the deposits in the savings banks, and they are prone to make a comparison with the savings-bank deposits of this country. Thus, it has been pointed out that in 1910 the deposits in the German savings banks amounted to 839,000,000*l*., or 12*l*. 18*s*. per head, as compared with 221,157,000*l*., or only 4*l*. 18*s*. per head, in the case of the United Kingdom.

But it must be remembered that the so-called savings banks of Germany are really State or municipal banks working largely in competition with the mercantile banks of that country. Practically no limit is placed upon the amounts which may be deposited with these savings banks by individual depositors, whereas in this country the limit of 200*l*. cannot be exceeded. The classes of depositors, who are mainly responsible for the huge deposits in the German savings banks, in this country use the joint stock banks. Moreover, in making a comparison between the banking resources of this country and those of Germany, it may be pointed out that a huge amount of British capital is deposited with the colonial and foreign banks having offices in London.

The predominance of London in the international money markets has probably never been greater than it is at the present time, and although the older countries, such as France, Germany, and to a smaller extent Italy and Austria, are now able to finance their own foreign trade, the opening up of new countries has created a vast and profitable field for the employment of British credit.

The stability of German banks has been considerably improved in recent years, and a striking manifestation of the financial power of the Reichsbank was afforded within the past twelve months by the addition of 20,000,000*l*. to its gold reserves.

It is also worthy of note that the gold coin in circulation in Germany is estimated to amount to upwards of 180,000,000*l*., as compared with only about 110,000,000*l*. to 120,000,000*l*. in circulation in this country.

Attention may be directed to the vast development that has taken place in the mercantile marine of Germany and the United Kingdom respectively within the past thirty years. In 1880 the German Empire owned 1,181,525 net tons of shipping; in 1911 the tonnage owned was 3,023,700, an increase of 1,842,225 tons, or 156 per cent. In 1880 the net tonnage of the merchant vessels owned by the United Kingdom was 6,574,513; in 1911 the total was 11,683,000 tons, an increase of 5,108,687 tons, or 77·7 per cent. It will be observed that although the ratio of increase in the case of the United Kingdom was only one-half that of Germany, the actual increase was over two millions more than the total tonnage owned by Germany in 1911. The bare figures given above do not reveal the whole of the vast changes that have taken place, such as the substitution of steam vessels for sailing ships, the increased carrying power and efficiency of modern passenger and cargo steamships, &c.

It may be fairly claimed that the expansion of the foreign trade of Germany has helped largely the growth of the British mercantile marine. In 1911 the total tonnage of vessels engaged in the foreign trade of the German Empire, entered and cleared from German ports, was 49,459,000. Of this total the German vessels represented 24,895,000 tons, or 50·4 per cent.; while foreign vessels (largely British), accounted for 24,564,000 tons, or 49·6 per cent. It may be estimated, therefore, that about one-half of Germany's seaborne trade is carried in foreign vessels.

In 1880 the tonnage of vessels entered and cleared in the foreign trade of Germany was only 13,066,000 tons, and of this total the German vessels represented 5,108,000 tons, or 39·1 per cent. German vessels are, therefore, carrying a much larger proportion of her seaborne commerce than they did in 1880.

In 1880 the tonnage of British and foreign vessels entered and cleared in the foreign trade of the United Kingdom amounted to 49,679,000 tons, and the British proportion of the total tonnage was 72·2 per cent. In 1911 the total tonnage entered and cleared in the foreign trade of the United Kingdom was 138,907,000 tons, and the proportion of British vessels to the total was 59 per cent. It will be noted, therefore, that in the case of the United Kingdom the tendency has been in the opposite direction to that of Germany, where, as stated above, we find a marked increase in the proportion of Germany's foreign trade carried in German vessels.

The progress of German shipbuilding has been in keeping with the development of her mercantile marine. For the seven years 1898–1904 the average annual output of the German yards was 240,800 tons. For the year 1913 the output of the German yards amounted to 618,800 tons. The output of the British yards for the seven years 1898–1904 averaged 898,000 tons per annum. Last year the output of the British yards aggregated 2,203,000 tons.

The Suez Canal returns also demonstrate in a striking manner the growth of Germany's mercantile marine. In 1892 the gross tonnage of vessels that passed through the Suez Canal was 10,866,400 tons. Of this aggregate, the United Kingdom accounted for 8,102,000 tons, or 74·5 per cent. The German tonnage only amounted to 809,000 tons, or 7·4 per cent. During the South African War a large number of British vessels were diverted from their usual services in the Far East to South Africa, and there was a very considerable decrease in the tonnage of British vessels passing through the Canal, and, concurrently, there was a very large increase in the tonnage of German vessels passing through the Canal. In 1912 the gross tonnage of all vessels that passed through the Canal was 28,009,000 tons. The United Kingdom's share of this aggregate was 17,611,000 tons, or 62·9 per cent.; while Germany's share amounted to 4,241,000 tons, or 15·1 per cent. Having regard to all the circumstances, we have perhaps good reason to congratulate ourselves upon the manner in which we have been able to retain our predominant position in this trade, notwithstanding the vast increase that has taken place in the volume of the trade passing through the great waterway.

The following table contains a comparative statement of the working of the railways of Germany and the United Kingdom for the years 1910 and 1911 respectively:—

Railways.

	Germany. Year 1910.	United Kingdom. Year 1911.
Miles open	36,658 of which total 3,539 kilom. worked by companies.	23,417
Cost of construction	£852,963,000	Amount of capital— £1,136,501,000
Cost per mile	£23,178	£49,410
Number of passengers carried	1,541,278,000	1,326,317,000
Tonnage of goods carried	575,330,000	523,577,000
Total receipts....	£149,544,000	£127,199,000
Working expenses	£101,692,000	£78,617,000
Net receipts	£47,852,000	£48,582,000
Percentage of net receipts to cost of construction	5·06	Average rate of dividend— 3·52

Between 1888 and 1910 the traffic receipts of the railways of Germany increased from 58,400,000*l.* to 149,544,000*l.*, a growth of 156 per cent.

Between 1888 and 1911 the gross receipts of the railways of the United Kingdom increased from 72,900,000*l.* to 127,199,000*l.*, a growth of 54,299,000*l.*, or 74·3 per cent. The German ratio of increase was therefore about twice as great as the British.

The coastwise tonnage of shipping entered and cleared from British ports, namely, 93,416,000 tons in 1911, was very much greater than the coastwise tonnage entered and cleared from German ports. On the other hand, it must be remembered that the inland waterways of Germany have been very much more fully developed than those of the United Kingdom. In 1911 the mileage of the inland waterways of Germany amounted to 15,320. At the same date the mileage of the navigable waterways of the United Kingdom only amounted to 8,180. In 1880 the total goods traffic in the German Rhine ports alone amounted to 5,638,000 tons. In 1911 it amounted to 54,108,000 tons, an increase of 960 per cent.

In the year 1910 goods to the amount of 91,000,000 tons were carried on all the German internal waterways.

Practically all the railways in Germany are State-owned, and they have been developed rather with a view to public economic requirements than to private interests, and the railway revenues form 34 per cent. of the total revenues of the Empire and the Federal States. I very much doubt, however, whether the economic development of Germany has been in any way due to the State control of the railways. Of late years there have been grave complaints of want of facilities, rolling stock, &c., and the financing of the railways has proved a source of embarrassment to some of the Federal States.

The wonderful expansion of the manufacturing industries of Germany referred to above has naturally been reflected in her foreign trade returns. Between 1888 and 1912 the aggregate value of the foreign trade of Germany increased from 323,585,000*l.* to 982,615,000*l.*, an increase of 659,030,000*l.*, or 204 per cent. Within the same period the aggregate value of the foreign trade of the United Kingdom advanced from 558,100,000*l.* to 1,120,125,000*l.*, an increase of 562,025,000*l.*, or 100·7 per cent. A detailed statement of the apportionment of the increase in the foreign trade of each country as between imports and exports is furnished in the table appended :—

Comparative table showing growth of foreign trade of Germany and the United Kingdom since 1888 (*when the Kaiser ascended the throne*).

Germany (*special trade*).

	1888.	1912.	Increase.	Per cent.
	£	£	£	
Imports	163,215,000	534,775,000	371,560,000	227·6
Exports	160,370,000	447,840,000	287,470,000	179·3
Total foreign trade	323,585,000	982,615,000	659,030,000	204
Excess of imports over exports	2,845,000	86,935,000	—	—

United Kingdom (special trade).

	1888.	1912.	Increase.	Per cent.
	£	£	£	
Imports	323,600,000	632,902,000	309,302,000	92·5
Exports	234,500,000	487,223,000	252,723,000	107·7
Total foreign trade	558,100,000	1,120,125,000	562,025,000	100·7
Excess of imports over exports	89,100,000	145,679,000	—	—

There are several remarkable features brought out by this table. In the first place attention may be directed to the fact that during the period named the foreign trade of Germany has grown at about twice as large a ratio as that of the United Kingdom. In the case of Germany, the annual average rate of increase was 8·5 per cent., as compared with an annual average increase of 4·1 per cent. in the case of the United Kingdom. Again, it will be noticed that the actual increase in the aggregate value of the foreign trade of Germany was 659,030,000*l.*, or 97,005,000*l.* in excess of the actual increase of the value of British trade. It will be observed that Germany increased her imports at a much greater ratio than her exports, with the result that the excess of imports over exports was, in 1912, 86,935,000*l.*, as compared with an excess of imports of only 2,845,000*l.* twenty-five years earlier.

In the case of the United Kingdom, the increase of exports was at a considerably higher ratio than the increase of imports, but notwithstanding this the excess of imports over exports advanced from 89,100,000*l.* in 1888 to 145,679,000*l.* in 1912.

From a close examination of the course of the foreign trade of the two countries during the past quarter of a century I am of opinion that between the years 1920 and 1923 the value of the special trade of Germany will exceed that of the special trade of the United Kingdom. If our re-exports are included in the British total it will, of course, take Germany many more years to overtake the aggregate value of British trade.

I have prepared the following tables showing the value of the imports into Germany for home consumption and the exports of German produce and manufactures, in order to bring out clearly the relative importance of the United Kingdom and the British Empire in the foreign trade of Germany in the years 1900 and 1911 respectively:—

Imports into Germany for home consumption.

Country.	1911.		1900.	
	Amount.	Per cent. of total.	Amount.	Per cent. of total.
	£		£	
Great Britain	40,440,000	8·3	42,000,000	14·5
British India, including Ceylon and Straits Settlements	25,240,000	5·2	11,235,000	3·9
Australia	12,400,000	2·6	6,100,000	2·0
British East Africa and British West Africa	5,335,000	1·1	1,408,000	0·5
British South Africa	2,790,000	0·6	1,300,000	0·4
Canada	1.200,000	0·25	319,000	0·1
British West Indies	790,000	0·17	477,000	0·1
British West Africa	300,000	0·07	105,000	—
Total British Empire	88,495,000	18·3	62,944,000	21·5
Principal foreign countries:—				
Russia	83,440,000	17·1	36,425,000	12·5
United States	67,170,000	13·8	51,040,000	16·9
Austria-Hungary	36,900,000	7·6	35,221,000	12·0
France	27,000,000	5·4	15,128,000	5·1
Italy	14,240,000	2·9	9,056,000	3·1
Total imports all countries	477,212,000	—	288,280,000	—

Exports of German produce and manufactures.

Country.	1911.		1900.	
	Amount.	Percentage of total exports.	Amount.	Percentage of total exports.
	£		£	
United Kingdom	56,985,000	14	45,610,000	19·2
British India	5,760,000	1·3	3,590,000	1·6
Australia	3,935,000	1·0	2,395,000	1·0
British South Africa	2,375,000	0·6	705,000	0·3
Canada	2,145,000	0·5	1,000,000	0·4
British West Africa	665,000	0·2	380,000	0·2
British West Indies, &c.	280,000	0·1	140,000	0·1
Total British Empire	72,145,000	17·7	53,820,000	22·8
Principal foreign countries:—				
Austria-Hungary	45,885,000	11·3	25,535,000	10·7
Russia	35,040,000	8·6	16.245,000	6·8
United States	31,990,000	7·9	21,980,000	9·3
France	29,930,000	7·4	13,880,000	5·8
Italy	17,440,000	4·3	6,365,000	2·7
Total exports all countries	405,300,000	—	237,000,000	—

In 1911 the imports into Germany from the United Kingdom were valued at 40,400,000*l.*, and they formed 8·3 per cent. of the total imports. In the same year the imports into Germany from the overseas Dominions of the British Empire were valued at 48,055,000*l.*, or 10 per cent. of the total imports. That is to say, the aggregate imports into Germany from the British Empire in 1911 were valued at 88,495,000*l.*, or 18·3 per cent. of the total imports. In 1900 the imports into Germany from the United Kingdom were valued at 42,000,000*l.*, or 14·5 per cent. of the total imports, and the imports from the overseas Dominions were valued at 20,944,000*l.*, or 7 per cent. of the total. The aggregate value of the imports from the British Empire in 1900 was 62,944,000*l.*, or 21·5 per cent. of the total imports.

In 1911 the exports from Germany to the United Kingdom were valued at 56,985,000*l.*, or 14 per cent. of the total exports. During the same year the exports from Germany to the British overseas Dominions were valued at 15,160,000*l.*, or 3·7 per cent. of the total exports. The aggregate value of the exports from Germany to the British Empire was, therefore, 72,145,000*l.*, or 17·7 per cent. of the total. In 1900 the exports of German manufactures and produce to the United Kingdom were valued at 45,610,000*l.*, or 19·2 per cent. of the total, and the exports to the rest of the British Empire were valued at 8,210,000*l.*, or 3·6 per cent. of the total. The aggregate value of the exports to the British Empire was 53,820,000*l.*, or 22·8 per cent. of the total.

The total value of the direct trade between the British Empire and Germany in 1911 was 160,640,000*l.*, or 18·2 per cent. of the entire foreign trade of Germany. In 1900 the total trade between the two Empires was valued at 116,764,000*l.*, or 22·2 per cent. of the entire trade. It will be noted, therefore, that notwithstanding the fact that during the period 1900–1911 the aggregate value of the trade exchanged between the two Empires increased to the extent of 43,876,000*l.*, the share of the British Empire in the total foreign trade of Germany declined from 22·2 per cent. to 18·2 per cent. The United Kingdom is relatively losing ground in both imports and exports, but the rest of the British Empire is rapidly increasing its relative and actual hold on German trade, and, as a matter of fact, the British overseas Dominions have become one of the main sources of supply of food stuffs and raw materials to the German Empire. The other notable features which are brought out by the foregoing tables are: (1) The growth of Germany's trade with Russia, (2) the growth of Germany's trade with France, and (3) the relative decline of Germany's trade with the United States. Germany has no overseas Empire capable of exchanging a large trade with the motherland, and she has, therefore, been compelled to seek markets in every part of the world. Her efforts in this direction have proved entirely successful. German trade is yearly becoming more widely spread throughout the world, and she is, to-day, much less dependent upon any one single market than she was in 1900.

I have prepared the two following tables in order to show the relative importance of Germany in the foreign trade of the United Kingdom in the years 1904 and 1912 respectively:—

Net value of merchandise consigned from various foreign countries and British Possessions retained in the United Kingdom. (Exclusive of bullion and specie.) [Cd–7022.]

Year	1912.		1904.	
	Amount.	Per cent. of total imports.	Amount.	Per cent. of total imports.
Principal foreign countries.	£		£	
United States	123,401,000	19·5	108,053,000	22·5
Germany	65,841,000	10·4	46,845,000	9·7
France	40,107,000	6·3	40,069,000	8·5
Argentina	39,352,000	6·2	22,666,000	4·7
Russia	38,091,000	6·0	31,841,000	6·6
Belgium	22,772,000	3·6	15,876,000	3·3
Denmark	21,938,000	3·4	15,542,000	3·2
Netherlands	20,846,000	3·3	14,955,000	3·1
Egypt	19,608,000	3·1	12,076,000	2·5
Total foreign countries ...	503,173,000	79·5	391,951,000	81·7
Principal British Possessions.				
British India	40,418,000	6·4	28,702,000	6·0
Canada	25,694,000	4·0	22,378,000	4·6
Australia	23,787,000	3·7	15,404,000	3·2
New Zealand	16,094,000	2·5	10,652,000	2·2
Union of South Africa ..	5,144,000	0·8	2,605,000	0·5
Total British Possessions	129,799,000	20·5	88,842,000	18·3
Total imports	632,902,000	—	480,734,000	—

Produce and manufactures of the United Kingdom consigned to each foreign country and British Possession. (Exclusive of bullion and specie.) Cd-7022.]

Year	1912.		1904.	
	Amount.	Per cent. of total exports.	Amount.	Per cent. of total exports.
Principal foreign countries.	£		£	
Germany	40,362,000	8 2	25,101,000	8 ·3
United States	30,065,000	6 ·1	20,197,000	6 ·7
France	25,585,000	5 ·2	15,194,000	5 ·0
Argentina	20,549,000	4 ·2	10,814,000	3 ·6
Netherlands	14,281,000	2 ·9	8,179,000	2 ·7
Italy	14,007,000	2 ·8	8,370,000	2 ·8
Russia	13,737,000	2 ·8	8,229,000	2 ·7
Brazil	12,657,000	2 ·5	5,975,000	2 ·0
Japan	12,229,000	2 ·5	4,889,000	1 ·6
Belgium	12,193,000	2 ·5	7,858,000	2 ·6
China	10,780,000	2 ·2	8,808,000	2 ·9
Egypt	9,448,000	1 ·9	8,273,000	2 ·7
Turkey	8,115,000	1 ·6	7,346,000	2 ·4
Total foreign countries	310,130,000	63 ·7	188,287,000	62 ·7
British Possessions.				
British India	57,626,000	11 ·8	40,641,000	13 ·5
Australia	34,840,000	7 ·1	17,336,000	5 ·7
Canada	23,531,000	4 ·8	10,624,000	3 ·5
Union of South Africa	21,439,000	4 ·4	17,817,000	5 ·9
Total British Possessions	177,092,000	36 ·3	112,423,000	37 ·3
Total	487,223,000	—	300,711,000	—

In 1912 Germany took from the United Kingdom exports to the value of 40,362,000*l.*, or 8·2 per cent. of the total, as compared with 25,101,000*l.*, or 8·3 per cent., in 1904. In 1912 the imports from Germany into the United Kingdom were valued at 65,841,000*l.*, or 10·4 per cent. of the total, as compared with 46,845,000*l.*, or 9·7 per cent., in 1904. Germany is, therefore, maintaining her relative position in the foreign trade of the United Kingdom; but attention may be directed to the fact that Germany is, relatively speaking, a less important market to the United Kingdom than the latter is to Germany. About 36 per cent. of our exports are now consigned to the rest of the British Empire, and 20 per cent. of our imports are received therefrom. Having regard to the triangulation of trade and to the magnitude of Germany's trade with our Overseas Dominions, it is perfectly obvious that a very large proportion of our trade with the rest of the British Empire is directly dependent upon German imports from and German exports to India, Australasia, South Africa, &c. On the whole, it may be said that we have managed to spread our trade so widely throughout the world that we are not directly dependent upon any one single market for our prosperity. Germany is, of course, one of our best customers, and the United Kingdom is of decisive importance to Germany. The exchange of goods, as Sir Francis Oppenheimer, our Consul-General for Frankfort, pointed out in his Report for the year 1909, embraces raw materials, half and fully finished manufactures, in which exchange each of the two countries furnishes to the other those materials which it can advantageously spare. In this exchange the traffic in half-finished manufactures has become one of particular importance. In this class, as in that of finished goods, the United Kingdom prevails in the elder technics and industries. Chemical raw-stuffs, yarn, wool, hides, &c., are shipped to Germany in great quantities by the United Kingdom. The predominance of the United Kingdom extends, however, also to the finished goods of the older productions. This is characterised by the import and export of machinery. Even to-day Germany receives from the United Kingdom machines for such branches of industry in which mechanical working has already for some time past been introduced, *e.g.*, agricultural and textile machines. On the other hand, the United Kingdom receives from Germany machines for the newer branches of manufacture, *e.g.*, electro-technical machines and mining machines, &c., in which the technical development of Germany strives to excel.

It is, furthermore, an interesting fact that British industry is steadily securing the German market for entirely modern articles, *e.g.*, goods of fashion and articles of luxury. This may be gathered from the increasing export in prepared and unprepared leather, lace goods, British cloth, plate glass, porcelain, china and high-class notepaper. For British production, then, the British lead in matters of fashion has become a valuable asset.

The international trade of Germany is mainly industrial in character. Practically two-thirds of the exports are manufactured goods and raw materials for manufactures form more than one-half of the total imports. In order to show how closely the character of the foreign trade of Germany approximates to that of the United Kingdom I have prepared the following comparative statement, which is based upon the respective official classifications. It must be remembered that the particulars given for the several categories are not necessarily comparable with the particulars for corresponding categories in the trade returns of either country.

Imports (special trade). *Year* 1911.
[000's omitted.]

United Kingdom.	Value.	Per cent. of total.	Germany.	Value.	Per cent. of total.
	£			£	
Food, drink and tobacco	249,647,	43·3	Live animals ...	11,400,	2·5
Raw materials and articles mainly manufactured	188,201,	32·6	Articles of food .	135,800,	28·4
Articles wholly or mainly manufactured	137,212,	23·8	Raw materials and partly manufactured articles	259,100,	54·3
Miscellaneous	2,338,	·4	Manufactured articles	70,900,	14·8
Total	577,398,	—		477,200,	—

Exports (special trade). *Year* 1911.
[000's omitted.]

United Kingdom.	Value.	Per cent. of total.	Germany.	Value.	Per cent. of total.
	£			£	
Food, drink and tobacco	29,038,	6·4	Live animals	600,	0·2
Raw materials and articles mainly manufactured	53,726,	11·8	Articles of food	38,600,	9·7
Articles wholly or mainly manufactured	362,223,	79·8	Raw materials and partly manufactured articles	99,800,	25·0
Miscellaneous....	9,132,	2·0	Manufactures ...	259,500,	65·1
Total	454,119,	—		398,500,	—

The financial system of Germany has been so fully dealt with by Mr. Percy Ashley and Mr. Wynnard Hooper, and others, that I need not take up any time with a description of it, and I must content myself with pointing out that in 1911 the Debt of the Imperial Government and the Federal Governments amounted to 1,028,600,000*l.*, or 15*l.* 16*s.* 8*d.* per head of the population. It must be remembered, however, that in Germany the State has undertaken not only the postal, telegraphic and telephonic services, but about 95 per cent. of the railways are owned and worked by the State. The value of the Prussian-Hessian railways alone has been estimated at 950,000,000*l.* In addition, the State Governments own extensive arable lands and mines, and 50 per cent. of all the forests belong to the States or the Municipalities. Even allowing for an over-estimate as to the value of the State railways, it is obvious that the net debt per head in Germany is very much less than in this country.

In 1911 the national debt of the United Kingdom amounted to 747,750,000*l.*, or 16*l.* 10*s.* per head of the population, and the only reproductive undertakings which we have to set against this mass of indebtedness are the Post Office, the Telephones and the investment in Suez Canal shares. Of course, there are, in addition, assets in the shape of public buildings, dockyards, lands and works, which have an enormous aggregate value.

With regard to the question of expenditure upon armaments, in 1895 Germany's outlay upon her army and navy was 43,816,000*l.*, or 1*l.* 15*s.* per head. In that year Schmoller estimated the national wealth of Germany at 10,000,000,000*l.*, or 193*l.* per head, and the national income at 1,200,000,000*l.*, or 23*l.* per head. In other words, in 1895 Germany's expenditure on armaments was 8*s.* 9*d.* per cent. of the national wealth and 3*l.* 10*s.* per cent. of the national income.

In 1912 Germany's expenditure on her army and navy amounted to 70,049,000*l.*, or 1*l.* 1*s.* 2*d.* per head. In that year her national wealth was estimated by Helfferich, and his estimate is confirmed by others, at about 15,000,000,000*l.*, and the national income at 2,000,000,000*l.* In 1912, therefore, Germany's expenditure on her army and navy was only 9*s.* 4*d.* per cent. of the national wealth and 3*l.* 10*s.* per cent. of the national income. It is true that within the past seventeen years Germany's outlay upon armaments has increased to the extent of 26,233,000*l.*, but it is not generally realised that within the same period her national wealth has increased to the extent of at least 5,000,000,000*l.* and her national income to the extent of at least 750,000,000*l.* The period referred to does not include the special levy of 50,000,000*l.* upon capital nor the permanent increase of expenditure amounting to 10,000,000*l.* per annum authorised by the Army Act of last year.

On the whole, having regard to the improvement that has taken place in the standard of living in Germany within the past seventeen years, I am of opinion that her expenditure upon armaments constitutes a much less heavy burden upon her people than it did in 1895. I am further of opinion that, provided Germany's economic expansion continues at the ratio maintained during the past decade (and apart from war I see no reason why it should not do so), fifteen years hence Germany should be in a position to expend upon armaments at least 100,000,000*l.* per annum, and this without placing upon her people a relatively heavier burden than they are called upon to carry to-day.

In 1885 the late Sir Robert Giffen estimated the national wealth of the United Kingdom at 10,040,000,000*l.* Our expenditure on the army and navy in that year amounted to 31,500,000*l.*, or 6*s.* 4*d.* per cent. of the national wealth and 3*l.* per cent. of the national income.

For the year to March 31, 1913, the Army and Navy estimates amounted together to 72,436,000*l.*, or 1*l.* 10*s.* 10*d.* per head. As stated elsewhere, our national wealth at the end of 1912 may be estimated at 16,500,000,000*l.*, and our national income for that year may be estimated to have amounted to at least 2,120,000,000*l.* In 1912, therefore, our outlay upon armaments bore a ratio of 8*s.* 9*d.* per cent. to the national wealth and 3*l.* 7*s.* 8*d.* per cent. to the national income. Our ratios, it will be observed, approximate very closely to those of Germany, but in the case of the latter Empire it must be remembered that universal service has imposed upon German people a burden which cannot be estimated to amount to less than 24,000,000*l.* per annum in respect of her vast army of nearly 800,000 men.

In making a comparison of this nature it must also be borne in mind that the British Navy protects the trade of the whole Empire, and, strictly speaking, the outlay upon armaments should be considered in relation to the resources of the Empire as a whole and not to those of the United Kingdom only. In 1912 the Empire's expenditure on Imperial defence (including India, 20,249,000*l.*; Australia, 4,775,000*l.*; and Canada, 2,285,000*l.*) amounted to 102,440,000*l.* The national wealth of the Empire may be estimated at 25,000,000,000*l.*, and its national income at 3,400,000,000*l.* Imperial defence, therefore, represented in 1912 approximately 8*s.* per cent. of the national wealth and 3*l.* per cent. of the national income. Both the United Kingdom and India are bearing at the present time more than their proportionate share of the expenditure on Imperial defence, and this disparity has, in the case of the United Kingdom, been considerably increased under the Budget for 1914–15.

I should like to refer briefly to the position of the trade balance of each country. The United Kingdom is the greatest creditor nation in the world. Our income from investments abroad cannot amount to less than 190,000,000*l.* per annum. The earnings of our shipping engaged in the carrying trade of the world may be estimated for 1913 at not less than 130,000,000*l.* (the average figure for the past five years is well over 100,000,000*l.*); and the earnings of our banking, commercial and insurance houses engaged in the conduct of the trade of the world may be estimated at not less than 55,000,000*l.*

per annum. Theoretically, therefore, if we did not export a single pound's worth of manufactures we should stand to receive from our foreign creditors at least 375,000,000*l*. per annum. As a matter of fact, last year we did not bring home more than half the amount due to us, the balance having been re-invested abroad. In 1888 the excess of imports over exports in the case of the United Kingdom amounted to 89,100,000*l*. In 1912 it amounted to 145,679,000*l*.

In 1888 Germany's excess of imports over exports was only 2,845,000*l*. In 1912 the excess of imports amounted to 86,935,000*l*. Within the short space of twenty-five years Germany has won for herself the position of the second largest creditor nation in the world.

In 1907 it was estimated that the payments made by foreigners to Germany in respect of transports generally amounted to approximately 18,000,000*l*. In 1912, which it will be recalled was a good year for shipping, I estimate that they amounted to over 30,000,000*l*.

The following are approximate estimates of the principal items which enter into the adjustment of the trade balances of the two countries:—

Germany. Year 1912. (*General trade.*)

	£
Credits—	
Exports of manufactures, &c.	484,210,000
Exports of precious metals	7,100,000
Interest on capital invested abroad	50,000,000
Earnings of German shipping and transport generally	30,000,000
Earnings of German banking, insurance and mercantile houses engaged in foreign trade	10,000,000
Total	581,310,000
Debits—	
Imports of commodities	578,605,000
Imports of precious metals	16,250,000
Capital invested abroad	13,000,000
Total	607,855,000

United Kingdom. Year 1912. (*General trade.*)

	£
Credits—	
Exports of domestic produce, &c.	487,434,000
Re-exports	111,838,000
Exports of bullion and specie	64,871,000
Invisible Exports—	
Interest on investments abroad	185,000,000
Gross earnings of British mercantile marine, say	100,000,000
Gross earnings of British banking, mercantile, commission and insurance houses carrying on trade abroad	55,000,000
Total	1,004,143,000

	£
Debits—	
Imports—	
Commodities	744,897,000
Bullion and specie	76,311,000
Invisible imports—	
Amount of capital invested abroad	185,000,000
Interest payable on foreign and colonial holdings of British securities, and earnings of foreign and colonial banks, insurance companies, &c., carrying on business within the United Kingdom, say	20,000,000
Total	1,026,208,000

It is quite impracticable to hope to submit a statement which will show an exact balance, because there are so many items which enter into the adjustment of the trade balance for which no reliable data are available. The above table does not include the value of the fish landed at British ports during the year 1912, which amounted to 13,234,000*l.*, nor does it include the imports and exports of precious stones (the average value of the net imports cannot be less than 4.000,000*l.* per annum). Again, it is impossible to frame estimates of the amounts annually expended abroad by British and German tourists, or the earnings of British and German subjects resident abroad which are annually remitted home to their respective countries. In this connection it is interesting to note that the pensions payable in England by the Indian Government alone exceed 2,000,000*l.* per annum. It is equally difficult to frame an estimate of the amount annually expended in the United Kingdom and Germany respectively by foreign tourists, or the amounts of the earnings of foreigners resident in the two countries which are annually remitted abroad. On the whole, it may be roughly estimated that in the case of both countries these two groups of income and expenditure are approximately equal.

It is necessary now to consider the national wealth and the national income of Germany in comparison with that of the United Kingdom. The income tax returns of Prussia afford a comparatively trustworthy basis for estimating the total income of the premier State, but the returns of the other States are made up on widely differing systems, and in order to frame an estimate of the income of the whole Empire it is necessary to make adjustments which leave room for a large margin of error. The Prussian returns are well prepared, although I am of opinion that they are not so well done as the income-tax returns of this country. At the same time they are more comprehensive than the British returns, because liability to income-tax commences at an income of 45*l.* in Prussia as compared with 160*l.* in this country. On the basis of the income-tax returns for 1912, Helfferich estimates the national income of Prussia at 1,200,000,000*l.*, or 30*l.* per head. He continues: "A thorough "examination of the assessment results in the other States having "an income tax system suitable for purposes of comparison, shows "that this average may be taken as representing approximately the "average income for the whole Empire." The population of the Empire amounts to approximately 66,000,000, and he thus arrives at an aggregate income of 1,980,000,000*l.* Adding to this total the private incomes of the public corporations, he arrives at a total income of 2,000,000,000*l.*

A similar calculation for the year 1896 would, he states, yield an aggregate income of 1,075,000,000*l.*, or 20·5*l.* per head. In sixteen years, therefore, according to the estimates of Helfferich, and they are confirmed by other authorities, the aggregate national income of Germany has increased by the sum of 925,000,000*l.*, and the average income per head has advanced from 20·5*l.* to 30*l.* The number of tax payers in Prussia with incomes above 45*l.* increased from 2,859,000 in 1896 to 7,542,000 in 1912.

The population of Germany in 1896 was 52,753,000, so that approximately one-third of the increase of her national income was due to the growth of population and two-thirds to the actual increase of income per head. The statistics as to the consumption of wheat and rye, meat, raw sugar, &c., support this conclusion.

The rule of thumb method for estimating the aggregate income of the people of this country is to double the gross assessment to the income-tax. For the year to March, 1912, the gross income reviewed by the several bodies of Income-tax Commissioners amounted to 1,070,142,000*l.*, and applying the method indicated above we arrive at an aggregate income of about 2,140,000,000*l.*, or 47*l.* per head.

The net output in the returns made under the Census of Production Act, 1906, amounted to 712,000,000*l.* The agricultural output of the United Kingdom for the same year was valued at, approximately, 200,000,000*l.*; and if we add to these figures, say, 100,000,000*l.* as the income from our shipping, 170,000,000*l.* as the income from our investments abroad, and 50,000,000*l.* as the earnings of our banking and mercantile houses engaged in the conduct of international trade, we shall arrive at a total income for 1907 of 1,232,000,000*l.* in respect of approximately 8,000,000 workers, or 154*l.* per head. For the remaining 8 millions of occupied persons it would not, perhaps, be unreasonable to assume an average income of 100*l.* per annum, say 800,000,000*l.*, and this would give approximately the same aggregate arrived at by doubling the gross assessments to income-tax, if we make allowance for the growth of income between 1907 and 1912.

On the same basis, the national income of the United Kingdom for the year 1896 amounted to 1,430,000,000*l.*, or 36*l.* per head. In sixteen years, therefore, the national income of the United Kingdom has increased to the extent of 710,000,000*l.*, and the average income per head has advanced from 36*l.* to 47*l.* The population of the United Kingdom in 1896 was 39,600,000, so that approximately two-sevenths of the increase of national income was due to the growth of population and five-sevenths to the growth of income.

A number of estimates of German national wealth have recently been prepared by German economists, the principal being as follows :—

	£
Schmoller (1895)	10,000,000,000
May (1907)	14,050,000,000
Ballod (1911)	13,500,000,000
Helfferich (1913)	15,000,000,000

All the foregoing estimates are based upon the Prussian income-tax and assessment system, and it is interesting to note how closely the estimates made in the later years approximate to each other. To some extent these estimates are confirmed by the fire insurance statistics which are carefully collated in Germany.

The most recent estimate, namely that of Helfferich, appears to have been prepared with great care, and it gives the following result :—

	£
Real and personal property insured against fire	10,000,000,000
Land in country and city	3,500,000,000
Mining property	250,000,000 to 300,000,000
Shipping, goods in transit and metallic money	300,000,000
Public property, including railways not insured against fire	1,500,000,000
Capital investments abroad	1,000,000,000
	16,550,000,000 to 16,600,000,000

Another method employed by Helfferich, based chiefly upon the assessment of the property tax, yielded a total of about 14,250,000,000*l.*, and he assumes that the actual value of Germany's national wealth lies between these two limits—say, not far from 15,000,000,000*l*., or 227*l*. per head.

In 1895 Schmoller estimated the national wealth of Germany at 10,000,000,000*l*., or 192*l*. per head. In eighteen years, therefore, the national wealth of Germany has advanced to the extent of 5,000,000,000*l*., or 50 per cent., and the average wealth per head has increased from 192*l*. to 227*l*. According to these estimates, therefore, German national wealth has increased during the past eighteen years at the average rate of 272,000,000*l*. per annum.

In 1885 the late Sir Robert Giffen estimated the national wealth of the United Kingdom at 10,040,000,000*l*., or 280*l*. per head. The method adopted by Sir Robert was briefly to take the gross income returned for assessment to the income-tax, capitalise the different portions of the income derived from capital at so many years' purchase, and then make an estimate for other property which does not come within the sweep of the income-tax net. I have applied this method to the gross income returned for assessment to the income-tax for the year to March 31, 1913, with certain modifications in the number of years' purchase in some instances, and the aggregate valuation at which I have arrived is 16,472,000,000*l*. The details of the valuation are shown in the table on the following page.

The aggregate of 16,500,000,000*l*. gives an average of 366*l*. per head. In the twenty-eight years 1885–1913, therefore, it may be estimated that the national wealth of the United Kingdom has increased to the extent of 6,460,000,000*l*., or at the average rate of 230,000,000*l*. per annum. This compares with an average increase of national wealth in Germany at the rate of 272,000,000*l*. per annum, but the period covered by the British average is ten years longer than that covered by the German average; and I am of opinion that within the past five years the average annual increase of wealth has been approximately the same in both countries. It will be noted, however, that there is still a very wide discrepancy between the average wealth per head. The British average is 366*l*. per head, as compared with 227*l*. per head in the case of Germany.

Although the ratio of increase of German wealth is now approaching that of the United Kingdom, our national wealth may be estimated to exceed that of Germany by at least 1,500,000,000*l*. Our average wealth per head is much greater than that of Germany, and during the past eighteen years, notwithstanding the wonderful advance that Germany has made, our increase per head has been very much larger than hers.

[000's omitted.]

	Income.	Number of years' purchase.	Capital.
Under Schedule A—	£		£
Lands	52,219,	25	1,305,475,
Houses	223,813,	15	3,357,195,
Other profits	1,297,	25	32,425,
Schedule B—			
Farmers' profits	17,457,	8	139,656,
Schedule C—			
Public funds less Home funds	35,049,	20	700,980,
Schedule D—			
Quarries, mines, ironworks	23,109,	4	92,436,
Gasworks, waterworks	19,588,	20	391,760,
Canals, docks, fishings, &c.	2,607,	20	52,140,
Other public companies	199,082,	15	2,986,230,
Foreign and Colonial securities and coupons	50,828,	20	1,016,560,
Railways in the United Kingdom ...	46,099,	25	1,152,475,
Railways out of United Kingdom	28,016,	20	560,320,
Other profits and interest	16,654,	20	233,080,
Trades and professions (one-fifth of total income of £222,676,000) ...	44,533,	15	667,995,
Total under income tax ...	—	—	12,688,727,
Trades and professions omitted, 20 per cent. of amount assessed or £44,533,000 of which one fifth is	8,906,	15	133,590,
Income of non-tax-paying classes derived from capital	100,000,	10	1,000,000,
Income from investments abroad or from shipping, banking and mercantile services not brought home	60,000,	15	900,000,
Movable property not yielding income. *e.g.*, furniture, works of art, &c. ...	—	—	1,000,000,
Government and local property ...	—	—	750,000,
Total	—	—	16,472,317,

Moreover, if the comparison of aggregate national wealth and national income be made upon the basis of the whole British Empire it will be found that the national income of the British Empire exceeds 3,500,000,000*l.*, and the national wealth amounts to approximately 25,000,000,000*l.*, or 10,000,000,000*l.* more than the wealth of the German Empire (for data, *see* article on "Imperial "Defence and Finance," *Nineteenth Century*, August, 1912).

Attention may be directed to the fact that whereas in the case of the United Kingdom, 3,800,000,000*l.*, or 23 per cent. of the national wealth, consists of capital investments in the Overseas Dominions and Possessions and in foreign countries, only 1,000,000,000*l.*, or 6·6 per cent. of the German national wealth is invested outside the limits of that Empire.

In 1904 the Imperial Marine Department compiled statistics based on inquiries made by German Consuls abroad regarding the amount of German capital invested abroad. In that year the total value of foreign securities was estimated at 800,000,000*l.*, and that of other capital investments Oversea at 500,000,000*l.* In 1904 the capital investments abroad, exclusive of stocks and shares, were distributed as follows:—

	£
Turkey	17,500,000
Africa	67,500,000
Persia Arabia and British India....	3,750,000
South East Asia	12,500,000
Far East	22,500,000
Australia and Polynesia	20,000,000
Central America and West Indies	60,000,000
South America (West Coast)	27,500,000
South America (East Coast)	80,000,000
United States of America and Canada	150,000,000
	461,250,000

The value of the holdings of foreign securities, namely, 800,000,000*l.*, added to the above, would give a total of 1,261,000,000*l.*, but these two totals must not be simply added together in this way. It is difficult to follow the distinction drawn by the Imperial Marine Office between the holdings of foreign securities and the capital investments oversea, and it appears to me that there must have been a considerable amount of overlapping, because by far the largest part of Germany's oversea capital investments are in the form of securities.

At the present time Germany's investments in Russia may be taken to be between 120,000,000*l.* and 150,000,000*l.* The investment in Italy used to be important, but has been nearly all absorbed by Italian purchases. The investment in Austro-Hungarian securities is still very large. The investment in Roumania amounts to over 50,000,000*l.* Germany's investments in Turkey may be estimated at about 40,000,000*l.* The investment in American railway bonds and shares used to be large, but has been about stable for several years past, some new issues being compensated by American purchases of older issues. On the whole, I am of opinion that the present value of Germany's capital investments abroad cannot exceed 1,000,000,000*l.*

In recent years Germany and Great Britain have been pursuing opposite policies in the matter of the investment of capital abroad. During 1912 the total value of home securities issued in Germany was 137,500,000*l.*, and foreign securities only accounted for 13,500,000*l.* In the same year the home securities issued in the United Kingdom amounted to 45,000,000*l.*, and the Colonial and foreign securities to 165,000,000*l.*

British capital is flowing abroad at a greater rate than it has ever done before, and the effect is shown by the growth of our exports of manufactures. On the other hand, Germany's foreign investments within the past seven years have practically remained stationary, but it must be remembered that the German Imperial Government and certain of the State Governments have consistently opposed the outflow of German capital into foreign countries, while the British Government has facilitated the investment of British capital abroad.

During the past five years British capital has been invested abroad at an average rate of 160,000,000*l.* per annum. This outflow of capital is of vital importance to the world in general and to Germany in particular. The granting of credits in London to undeveloped countries such as Argentina, Brazil, Chile, China, Japan, Australia, India, South Africa, Canada and the Straits Settlements, and the West Coast of Africa augments to a corresponding extent the purchasing power of these countries in the manufacturing centres of Europe, and as the United Kingdom cannot itself supply all the manufactures and commodities needed by these new countries, Germany has benefited to an extent little inferior to that of Great Britain. I am satisfied that if, through some calamity such as war, Great Britain should cease to invest capital abroad, Germany's exports throughout the world would fall off enormously, and in order to keep up her foreign trade Germany would be compelled to invest capital abroad on a very much larger scale than she finds it practicable to do at present. This would react unfavourably upon her industrial progress, as it would mean the locking up in foreign countries of a large amount of capital which is urgently required for the development of Germany's home industries.

On the other hand, Great Britain annually accumulates a larger surplus income than those who direct her economic policy appear to think she can find profitable employment for within the limits of the United Kingdom, and the necessities of Germany and Great Britain are therefore reciprocal in this most important matter. It may be doubted whether the great bulk of the people of Germany fully realise the extent to which their prosperity is bound up with the economic policy of Great Britain. Within the past two decades British capital and British enterprise have increased to an enormous extent the world's supplies of food stuff and raw materials, and if Great

Britain had not undertaken this work it is difficult to see how Germany's manufacturing industries could have expanded as they have done within the period named. I am, of course, speaking *ex parte*, but I think it may be fairly claimed that Great Britain, as the custodian of the world's largest supplies of loanable capital and the practical director of the economic policy of the world's greatest Empire, has exercised her powers wisely and unselfishly and in the best interests of the world as a whole.

So far as the existing economic relations of the two Empires with each other are concerned we may look to the immediate future with confidence. At the present time it may be affirmed that their true economic interests are reciprocal rather than antagonistic.

Great Britain is easily retaining her pre-eminence in shipping and shipbuilding and in banking and finance. In textiles, woollens and machinery, and in fact in most of our old industries, we have every reason to feel satisfied with our actual and our relative positions. On the other hand, Germany has won for herself a premier position in the newer technical industries which she has herself largely created. Moreover, it must always be remembered that the foundations of British commerce are so well laid and so widely spread that we cannot fail to benefit both directly and indirectly by any further additions to the productive wealth of the world that may result from the development of Germany's manufacturing industries.

But if we look, say, thirty-five years ahead—and thirty-five years is a very short span in the history of a nation—the prospect is not quite so assured. Germany's population will then number about 100,000,000, while ours will be in the near neighbourhood of 58,000,000. Suppose, for example, Great Britain found that the burden of taxation was falling with too heavy an incidence upon the sources of direct taxation, and that in order to re-establish an equilibrium it was necessary to resort to a tariff for revenue purposes, it is difficult to avoid the conclusion that some friction might arise with Germany. We must also look to the question of the future supplies of food-stuffs and raw materials. The recent great increase in the cost of living has given this question an urgency that it did not possess before, and it would appear to be highly probable that in the course of, say, the next five and thirty years, the competition between Great Britain, the United States and Germany for the food supplies and raw materials of the world will become acute unless fresh areas of supply are opened up in the meantime, and it is in this direction that co-operation between British capital and enterprise and German industry would appear to offer a most fruitful field. Germany has shown the world what marvellous results can be achieved by the application of scientific methods to the intensive cultivation of agriculture ; Great Britain has shown the world how to increase its supplies of food-stuffs and raw materials by the building of railways, the institution of well ordered government, and the development of the maritime carrying trade.

Germany and Great Britain have been the pioneers of social legislation. They are solving, if they have not already solved, the problem of the transformation of their populations from agriculture to manufacturing industries. In this matter Great Britain was fifty years ahead of Germany, but the latter country has had the benefit of our experience and her transformation is proceeding without the dreadful sufferings through which our people had to pass. Still greater economic problems await solution, *e.g.*, the reconciliation of the interests of capital and labour—and the human race may hope to achieve as much good from the co-operation of two great national forces such as Britain and Germany as it may expect to suffer ill from their veiled or open antagonism. If all danger of a destructive economic conflict is to be avoided in the future, the national and Imperial policies of Britain and Germany must be fashioned and directed with a due regard to their individual as well as their mutual interests, and if this be done I am hopeful that the danger of economic rivalry in the future may be avoided.

DISCUSSION *on* MR. CRAMMOND'S PAPER.

LORD WELBY, in proposing the vote of thanks to the reader of the Paper, said the Paper was one of the very highest interest to all. He thought the knowledge which had been displayed by Mr. Crammond throughout the argument was extremely striking, and he hoped it would be widely read with a view of removing many doubts and fears that were entertained. Whatever might be thought of Bismarck's policy on many points, there could be only one opinion as to the marvellous creation he had made in Germany, which Germany owed to him, and which must be his lasting monument. As far as his (the speaker's) generation was concerned, which, of course, went back to a very distant period, they were astounded, and rightly astounded, at the progress Germany had made in the last sixty or seventy years. The Germany they remembered in the 'fifties was a cluster of insignificant States under insignificant princelings, headed by the so-called hegemony of Prussia and Austria intriguing against each other, with the result that Germany was really of no account in the world either as a power or as a nation. He asked them to compare that with the picture Mr. Crammond's Paper had shown them, and compare it with the figures and with the marvellous progress which was marked in almost every branch of German industry. They must feel that Bismarck had added a great and new industrial force to the productive power of the world. As far as he was concerned, he hailed with pleasure the development of Germany, and he thought most of his hearers would agree with him in adopting what, if he remembered rightly, Mr. Balfour had laid down with very great force, that it was a great mistake ever to think that the development of one country was acquired at the expense of another. The real fact of the matter was, that the development of one country really added a fresh source of supply to the industries of other countries; and therefore, as far as those relations were concerned, he thought they must all feel that the development of Germany was of great benefit to the world. One point he wished to note in the Paper on which perhaps a little more stress might have been laid. Mr. Crammond had compared and shown the difference in the population of the two countries. He had shown that Germany had now 64 millions while we had 45 millions. Unluckily it very often happened that the difference was lost sight of in dealing with the progress of the two nations. It must be clear to all the world that 64 people would produce more than 45, and he, therefore, felt that ought to be borne in mind. When the argument was put forward that Germany's progress was at a greater rate than our own, we should always have before us the fact that there was a much larger population there engaged in the work of production, and therefore it was a mistake to establish ratios as if the two countries were alike in size. He thought that was very often lost sight of, and in some cases had led to what he ventured to think was an abuse of statistics by the method in which the increase of Germany's power was laid stress upon to England's disadvantage. He thought from what they had heard in the Paper they could only come to the conclusion that, in spite of the energy and power of Germany, we were holding our own fairly in face of the keen competition which Germany set up. He had followed the comparison that Mr. Crammond had made throughout with the very greatest interest. He was much interested, because he had not realised before what Mr. Crammond had said about the very large amount of capital we had invested abroad which was re-invested. Perhaps it gave some hope to some of those people who were engaged levying income-tax, that by more stringent methods some of these investors might come within the range of the tax collectors. One point Mr. Crammond had dealt with he had listened to perhaps without much pleasure, and that was the question of armaments. He held a strong opinion upon that point; and to award between two nations, he would not call it a prize, but the supremacy in what he thought was a most extraordinary exhibition of waste and extravagance was very difficult. But passing that aside, on the whole he thought the rest of the Paper had been one of the most instructive nature, and one which he hoped would be widely spread and read abroad. He thought the effect of it must generally be rather to allay the fears which were often put forward, that we were losing our ground. He did not believe there was any justification for that belief. We had led commerce and industry far in front of the rest of the world for a very long time, and he did not believe that energy and power were failing us now. He felt satisfied, although competition was likely to be much keener in the future, that we would be able to hold our own; and with that assurance he was glad to think that, so far from there being any cry of jealousy or envy of Germany, by reason of the great advance of Germany there had come to the productive power of the world an enormous addition, and by that addition we should most distinctly benefit.

Sir GEORGE PAISH, in seconding the vote of thanks, said it was necessary to take several things into account to appreciate what was going on. First of all the comparisons covered a period in which Great Britain was engaged in war. That war affected our position for a period of something like five years; and during that time Germany pushed her finance and her trade for all they were worth. During that period Germany promoted in all parts of the world banking and other companies to push German trade, and placed large amounts of capital which, but for the war, would have come to Great Britain for money. That gave German trade a great impetus. The greater part of the expansion in German trade with other countries had taken place since about the years 1895 or 1897. Mr. Crammond had made comparisons of our foreign trade since 1904, after we had finally finished with the South African War. Since 1904, as they would see, our foreign trade had grown faster than that of Germany. In 1904 the exports of British goods were valued at 300 millions, and in 1912 at 487 millions, an expansion of 187 millions in the short space of eight years. The exports of Germany in 1900 were 237 millions and in 1911 404 millions, an expansion of 172 millions in eleven years. He thought it was of considerable importance that we should bear in mind the influence of the South African War upon our trade between 1899 and 1904, because of course the country could not attend to its normal business when engaged in war. The second point was the question of population. He personally attached great importance to population. Germany had become one of the dominant powers of Europe by reason of her great population. The French had been standing still in population, and no one in these days doubted that the power of Germany was greater than the power of France largely because of the population factor. When we looked to our own population, we saw that it was growing more slowly than the German population. He was not without hope that the difference in future would be less marked than in the past. The British increase in population in the past had been in spite of the diminution in the population of Ireland. He did not wish to tread on any controversial ground; but he thought that they had good reason to expect that when Ireland was more contented (and she had been more contented for some years past in consequence of the Land Purchase legislation), when Ireland was filled with greater hope and with confidence in her own future, there would probably be an expansion in the population of Ireland. An expansion in the population of Ireland would supplement the increase of population in Great Britain and would help to maintain the growth of population in the United Kingdom. In both Germany and the United Kingdom the rate at which population increased was steadily declining as wealth increased. Mr. Crammond, in referring to the balance of trade, had given in the letterpress the figure of 375 millions, but he did not confirm that in the table. Possibly it was a clerical error, but he was inclined to think that the figure given in the table was the more correct one. His own calculation was that we had now to receive something like 340,000,000*l* or 350,000,000*l*. from abroad. That was made up as to rather over 200 millions of interest, as to over 100 millions from shipping, and as to the balance of about 30,000,000*l*. or 40,000,000*l*. from income tax derived by insurance, commission earned by bankers, stockbrokers, commission agents, brokerage firms in Mincing Lane, and so on. There was an item of about 5,000,000*l*. which came to us for rent of offices, secretaries' salaries, and so on, in respect of British companies working abroad. In 1913 the excess of imports over exports, including treasure, was about 146,000,000*l*., after we placed abroad nearly 200,000,000*l*. of new capital. He thought Mr. Crammond had not perhaps done justice to England in the matter of iron. What he said about the relatively small expansion in the production of pig iron and steel was quite true; but we in this country in the last twenty years had been trying to make our labour more productive of income. In the cotton trade we were importing a comparatively small amount of raw cotton in proportion to our production, and we spun finer counts, and the proportion of labour to material in a yard of cotton cloth was much greater than it used to be. The Continent, on the other hand, was weaving coarse cotton goods, and the proportion of raw cotton to the total value was much greater than here. Exactly in the same way in the steel trade; we used to make pig iron and steel rails and export large quantities. In these days we were turning our iron into machinery, and instead of making steel rails we were making engines, bridges, ships and other things, and the aggregate growth of our iron, steel, machinery, hardware and shipbuilding trades had been enormous. It was much more profitable to make fully-manufactured goods than partly-manufactured goods; and in his judgment the growth of the iron trade had been exceedingly satisfactory, in spite of the fact that the increased output of pig iron, steel rails, and other heavier products had not shown an expansion corresponding to the growth either in Germany or the United States. In making comparisons between the growth of German and British trade respectively, it was necessary to remember that Germany had changed her method of making up her foreign trade figures. In 1888 Germany did not include the Hansa towns: and now she did, and that made a considerable difference. How much difference it was difficult to determine, but it was a substantial sum. It did not, of course, affect the fact that the expansion of German trade had been exceedingly great, but it did take away a percentage of the increase. Mr. Crammond had more or less confirmed other calculations as to the great expansion in income and wealth both in this country and in Germany, but his method of arriving at the British income was rather crude. A few years ago an exceedingly valuable calculation had been made by Mr. Flux in the Census of Production figures, and he thought that was much more scientific than Mr. Crammond's method of merely doubling the amount of income assessed to income-tax. With regard to the outlook, he thought they might look forward with confidence to their own future as well as to the future of Germany. The figures showed that two countries could grow wealthy together, and that the growing prosperity of Germany did not mean that England would be less prosperous, but more prosperous; and exactly in the same way the growth of the prosperity of England meant greater and not less wealth for Germany. Once the world realised that all could grow prosperous together, then international rivalries, which sometimes result in war, would be more likely to disappear. No one could conceive the great increase in the well-being of the world in modern times without realising that the prosperity of each country was governed by the prosperity of all countries.

Mr. C. Rozenraad said that Mr. Crammond had devoted a great deal of attention and care to his Paper, and he hoped he would not mind if he rectified the definition of the words "balance of "trade." The balance of trade was the difference between the imports and exports of a nation; but the figures of imports and exports were not sufficiently conclusive to obtain an exact idea of the true economic situation of a country. They must also take into consideration the balance of payment, comprising the bank commissions, interest on foreign securities, freights and many other items which could never be given accurately. The only barometer which could guide them to establish whether the balance of payment of a country was favourable or unfavourable was the rate of exchange; and Mr. Crammond did not mention the fact that Germany, whose imports constantly exceeded her exports, had very often a favourable rate of exchange leading to gold imports, as the result of her extensive shipping, banking and industrial business for which she received large remittances from abroad. The money spent by the foreigners who frequented her watering-places or studied at her Universities was also an important item. The interest and dividends on the many millions of foreign securities which were held in Germany led, also, to a more favourable rate of exchange. Mr. Crammond stated that the population of Germany in 1895 was 58 millions, but since then the population had rapidly increased, and was now nearly 70 millions. In view of the constant increase in her population and the development of her industrial production, which exceeded the amount she could absorb herself, Germany was obliged to find new markets abroad, and he (the speaker), who in his younger days spent four years in Berlin, taking an active part in the banking work of Germany, was able to see what her sons were doing to acquire a large portion of the world's trade. And if in those days Germany was already successful in extending her trade in every direction, her efforts since then to find new markets for her goods, to construct railways in China and other countries, had been crowned with great success. Her influence and commerce were developing in every direction. German banks were established in South America, China, &c., to promote German trade abroad; her ships connected Germany with all parts of the world, and she sent her sons, fully-equipped with the knowledge of foreign languages, everywhere to create new markets and to develop trade between the Fatherland and foreign countries. Germany tried, moreover, to extend her trade in Asia Minor. One of the leading German Banks—the Deutsche Bank—had established a branch in Bagdad, and other branches were to follow. In Belgium the same Bank had lately opened a branch in Brussels, while another of her principal banks, the Direction der Disconto Gesellschaft, had opened a branch in Antwerp. To develop the national trade must, indeed, be the principal object of all nations, especially now that taxation had increased so much everywhere. It was an easy thing for a Government when money was wanted to increase the burden of taxation of the nation, but it was not a sound financial policy. For a country which was constantly having to pay more taxes must forcibly increase its cost of production, and would, consequently, be unable to compete with other countries.

Mr. J. Ellis Barker said the Paper was very interesting, but many of the figures Mr. Crammond had quoted from German and English sources were more in the nature of guesses based on statistics than correct facts. He was afraid Mr. Crammond was not sufficiently acquainted with German affairs to be able to give a true picture of the economic position and development of that country. Mr. Crammond said he had given statistics relating to 1873, a year when the economic disturbances created by the Franco-German War had to some extent subsided. In 1873 there was in Germany a wild boom and consequent crisis of unprecedented severity, caused by the payment of the French war indemnity of 200,000,000*l*. in cash. That year was economically most abnormal. Throughout the Paper he noticed there was a Free Trade bias, which he thought was scarcely permissible in a scientific Paper. That was particularly noticeable when the author compared German with British progress. Mr. Crammond said: "Between 1861 and 1911 the net loss of the "United Kingdom by migration was 4,188,000." Between 1871 and 1905 Germany's net loss by migration amounted to 2,313,000. Apparently emigration between Germany and England compared as 1 and 2. During the last ten years there was on balance no emigration from Germany. On the contrary, there was immigration; whereas from England the emigration had lately been on an average between 200,000 and 300,000. It was not permissible to lump together large periods of time, and so give a wrong impression of the true position of affairs. Mr. Crammond referred to the fact that in 1882 there were 19 millions odd people employed in German agriculture, while there were in 1907 only 17 millions odd. Apparently there was a shrinkage of 1,500,000 in the people employed in agriculture. Perhaps Mr. Crammond did not know in the first place that, during the period mentioned, on an average from 500,000 to 700,000 people streamed from neighbouring countries into Germany and helped in agriculture. The remaining million or so which was apparently lost to agriculture was not lost in reality. More people worked in German agriculture at present than ever. The difference came partly from a technical difference in the taking of the census, and partly it was due to the fact that a lot of half-grown people and adults who used to be idle on the German farms went to the towns where, through the rise of industries, they could now find employment. Mr. Crammond quoted Sir Francis Oppenheimer, to show that the increased duty on foodstuffs had artificially raised the value of agricultural land. He (the speaker) thought the value of agricultural land had not been raised by the increased duties on agricultural produce. It had been raised through the greater productiveness per acre. Since 1879, the year when Protection was introduced, Germany's agricultural production had increased approximately twice in quantity and more than twice in value. That increase of produce had naturally caused a large increase in the value of the land. The value of capital, whether invested in business or in land, depended upon its return. Mr. Crammond gave an entirely unfair comparison of the production of agriculture in Germany and Great Britain. He gave the production of wheat, rye, cattle, pigs, milk, &c., in Germany as worth 477,000,000*l.*, and then gave the entire production of agriculture of England, Scotland and Ireland as worth 189,000,000*l.* Apparently the productiveness of agriculture in England and Germany compared as 2 and 5. That was totally wrong. For Germany, Mr. Crammond gave merely wheat, rye, cattle, &c., and he left out some of the most important items, such as barley, oats, potatoes, vegetables, fruit, sugar, tobacco, horses, poultry, &c. Germany was the largest potato-grower in the world. It produced one-third of the world's potatoes. Likewise, it was the largest producer of sugar. If Mr. Crammond had added all these things together he would have found that per square mile or per acre Germany produced both in quantity and in value between three and five times as much as was produced in the United Kingdom, that British and German agriculture produce compared, not as 2 and 5, but more likely as 2 and 12. Then Mr. Crammond lumped together coal and lignite, apparently not knowing that lignite had a very inferior combustible value to that of coal. He stated: "It is also curious to note the "comparatively slow growth of the woollen industry of Germany." Mr. Crammond had gone for information very largely to the German Statistical Year Book. If he had looked at its supplement pages, he would have found that Germany imported more raw wool than Great Britain. There was surely no reason to speak of the "slow growth" of the woollen industry of Germany. There was another mis-statement. Mr. Crammond had compared the position of the banks of England and Germany. He said: "In 1912 the deposits "of the German credit banks amounted to 468,000,000*l*. This total "is less than one-half of the deposits of the joint-stock banks of the "United Kingdom and the Bank of England which, at the beginning "of 1913 stood at 1,053,000,000*l*." It seemed very satisfactory that England had more than twice as much in the joint stock banks than Germany had; but, to start with, the figure for England was incorrect, because deposits here were counted often twice and sometimes three times over. Of the deposits placed with banks in the country, a large part was deposited in the London banks, which in turn deposited a large part in the Bank of England; so that the one thousand and odd million pounds of deposits in the United Kingdom was a gross over statement. On the other hand, the amount stated to be in the German credit banks of 468,000,000*l*. was a gross under statement. Mr. Crammond had mentioned in his Paper that in Germany there were something like 3,000 private banks. Germany was still a private banker's paradise. The proportion of money kept in private banks in Germany was enormously larger than it was in the United Kingdom. Consequently, if one wanted to make a fair comparison of bank deposits, one must either allow for the fact that there were enormous deposits in the German private banks for which there was no equivalent here, or one should give a warning that 468,000,000*l*. did not by any means represent all, but possibly only the smaller part, of the German bank deposits. Referring to the German savings banks, Mr. Crammond stated: "But it must be remembered that the "so-called savings banks of Germany are really State or municipal "banks working largely in competition with the mercantile banks "of that country." It was true that the German savings banks contained at present in deposits more than 1,000,000,000*l*., and that the British savings banks had less than a quarter of that sum. That extraordinary difference, which was very disconcerting to all good Free Traders, was not due to the fact which Mr. Crammond mentioned, that the German savings banks worked largely in competition with the mercantile banks of the country. They did not do anything of the kind. The German savings banks were not engaged in *bona-fide* banking business. They were chiefly engaged in investing their funds in mortgages on land and houses. Obviously no bank which had any current banking business could invest three-quarters of its assets in land and in bricks and mortar, especially as German mortgages were usually for long periods such as four, five or ten years. Besides, in Germany savings banks deposits could, as a rule, not be promptly withdrawn as in England, but at long notice. Then Mr. Crammond stated: "Practically "no limit is placed upon the amounts which may be deposited "with these savings banks by individual depositors, whereas in "this country the limit of 200*l.* cannot be exceeded." If Mr. Crammond had studied the German savings bank system better, he would know there were a few savings banks in which one may deposit 2,500*l.* as a maximum, but there were others in which the maximum deposit was only 50*l.*, 100*l.*, or 150*l.* The large deposits, up to 2,500*l.*, belonged generally to the working-classes; they were, as a rule, the funds of trade unions, co-operative societies, &c. The well-to-do and the middle-class did not put money into the savings banks because, as in England, they could make more money elsewhere. The fact that the German masses had more than four times as much in the savings banks as the British could not be explained by asserting that the German savings banks were ordinary banks. They were not. Then Mr. Crammond had said: "Even "allowing for an overestimate as to the value of the State railways, "it is obvious that the National net Debt per head in Germany is very "much less than in this country." That was incorrect. In Germany there was on balance no National Debt, because the assets of the States were considerably greater than all the State and National Debts combined. The national assets, such as State railways, forests, mines, salt works, &c., were worth more than 1,000,000,000*l.*

Mr. Rosenbaum said he had intended to make some observations and criticism of the Paper, but on account of the lateness of the hour he would ask to be allowed to contribute them to the *Journal.* There was one question, however, which, as Sir George Paish was present, he would like to put to him. He wished to know whether Sir George accepted the figure 375,000,000*l.* or thereabouts as the earnings of British investments abroad, and whether he also accepted the second part of the statement by Mr. Crammond, which to him seemed so extraordinary, that about one-half of this sum never reached this country. If the estimate of Mr. Crammond's were really true, then harking back to a suggestion let fall by Lord Welby, the yield of the new proposals which the Chancellor of the Exchequer had included in his present Budget for imposing an income-tax on all foreign investments ought to produce not 250,000*l.*, as the Chancellor had estimated, but from 12,000,000*l.* to 13,000,000*l.*

Sir **George Paish** said he did not agree with that statement of Mr. Crammond's. He thought the income did come back here in a very large measure, but not entirely. Owing to the condition of the income-tax law there had been a bonus, as it were, to people to keep their incomes away; but that only applied to very wealthy people, and he thought it did not amount to more than about 25,000,000*l*. a year.

The following criticism of the Paper was submitted by Mr. ROSENBAUM subsequently:—

In my opinion there is throughout the Paper a looseness of statistical expression which is regrettable. Masses of figures are thrown together without any explanation of their origin, or suggestion of their lesson. I will illustrate by the references to agriculture. We are given for Germany the numbers connected with agriculture and forestry at two dates. Those figures show that between 1882 and 1907 the numbers *employed* in the industry have *increased* by 1,600,000, while the numbers, including their dependents, have *decreased* by about the same number. There is no explanation or comment by Mr. Crammond of this remarkable divergence of movement. It is certainly not explained by the next sentence, which refers to the vast migration from the country to the towns. What we have apparently to account for is a decline from about eleven millions to less than eight millions in the number of the dependents on those actually employed in the agricultural industries. Is it desired by Mr. Crammond that the figures quoted should be regarded as proving any change in German agriculture, and, if so, what change? Again, in his reference to the successive censuses of the United Kingdom, a series of numbers are given relating to those engaged in agriculture. Mr. Crammond appears oblivious to the fact that the figures in successive censuses cannot be related to one another without some measure of correction on account especially of the changes in the bases and the classifications. The importance of this correction is illustrated by Mr. Charles Booth's well-known comparison, based on special investigations at the census office, of the numbers employed in agriculture at successive censuses. The differences in Mr. Booth's figures and those given in the Paper relating to the numbers employed in agriculture in the United Kingdom are shown in the following table:—

	Paper.	Booth.	Difference.
1871	2,487,000	2,506,000	+ 19,000
'81	2,378,000	2,362,000	− 16,000
'91	2,194,000	2,223,000	+ 29,000
1901	1,983,000	2,110,000	+ 127,000

It will be seen that according to this comparison the figures in the Paper for 1871 should be increased by about 19,000, and in 1901 by about 127,000.

I note again in his comparison between the growth of the agricultural industry in Germany and in the United Kingdom the differences in the period over which the comparisons are drawn appear to have been disregarded. The estimated increase in Germany, given on the authority of an unnamed member of the German Parliament, is 1,000,000,000*l.* for agricultural land. This estimate apparently relates to the period 1880–1908. Contrasted with this is the figure given by Sir R. H. Inglis Palgrave as the losses of agriculture between 1872 and 1901, at 1,600,000,000*l.* Does Mr. Crammond suggest that these figures relate approximately to the same matters? Ought he not to investigate and state to what extent these figures are comparable and, at any rate, suggest the inference which he would have the readers of his Paper draw?

It occurs to me, again, that Mr. Crammond has committed a serious statistical fallacy in his comparisons of the cotton industry in Germany and the United Kingdom. It is unquestionably true that the number of spindles employed in the United Kingdom (by the by, the figures given relate to the United Kingdom cotton industry, and not the Lancashire cotton industry) have increased much more rapidly than the spindles in Germany, but these figures measure, not the cotton industry, but the cotton-spinning industry. It would be necessary to adduce quite other figures—those relating to looms and those relating to the numbers employed in all branches of the industry, and, if possible, to the values of the outputs—before it would be possible to say definitely and by how much the cotton industry in one country is larger than in the other. However the comparison is instituted, so far as it relates to the cotton industry, there is little doubt that the result would be to show a very much larger industry in this country, but the difference is probably very much less than is indicated in or suggested by the Paper. Again, because the exports of woollen goods from the United Kingdom have increased between 1888 and 1912 more largely in the United Kingdom than in Germany, he comes to the conclusion "that the British industry has expanded much more "rapidly than that of Germany." Mr. Crammond appears entirely to have overlooked the home market in both cases. The German home market covers a population practically 50 per cent. larger than that of the United Kingdom. That population has in the period in question increased very much more rapidly than our own. The supply of their home market by imported goods is relatively very much smaller in Germany than in the United Kingdom. Taking all these factors into account—the relative size of the home markets, the relative rates of growth of the populations, the relative imports of woollen goods—it is by no means certain that, after allowing for the differences in the volume of exports, the woollen industry in Germany is not on the whole larger in volume and growing more rapidly than that of the United Kingdom.

In one of Mr. Crammond's tables some figures are given from which a conclusion is drawn as to the enormous increase of the excess of imports over exports in Germany between 1888 and 1912.

I note in the first place that the German figure for 1888, which is given in the Paper as 2,800,000*l.*, is in the first Fiscal Blue Book put at 4,200,000*l.*; but more important than this difference as tending to show that the figure was uniquely small is the fact that in the very next year the excess of imports is given in the Fiscal Blue Book as 42,000,000*l.*

I would venture to ask for some explanation of the differences for the same figures which appear at different pages of Mr. Crammond's Paper. Income from investments abroad is in one place put at 190*l.* millions, in another at 185*l.* millions, and in still another at 170*l.* millions. Shipping earnings, which are in one part of the Paper said to have amounted to 130*l.* millions, are in another part of the Paper assumed to be only 100*l.* millions. As all these figures are given on no other authority than that of Mr. Crammond, I suggest that it would have been proper in the case of a statistical Paper dealing directly with these matters to have explained more fully and in greater detail how these various figures were reached.

Mr. M. I. Trachtenberg said it seemed to him that, while Mr. Crammond had given different aspects of German progress, he had not dealt with those aspects in the fullest and completest manner. Referring to the figures of iron and steel production, it seemed to him that for a Paper of that nature before that Society, it was a *sine qua non* that the figures should be as up to date as possible, especially in view of the progress made in the last few years. Mr. Crammond gave a figure of German iron production for 1911 of 15½ million tons. They knew that the figure for last year was 19 million tons. Mr. Crammond's increase of 287 per cent. was therefore a very unsatisfactory way of stating the development in that respect. The position was even more marked in regard to steel. Mr. Crammond called attention to the fact that in 1910 Germany's production of steel was 13½ million tons. Germany's figure for 1913 was available, but for purposes of comparison we were thrown back on 1912. The steel production of Germany for 1912 was actually 17 million tons, an increase on Mr. Crammond's figure of no less than 3½ million tons. It seemed to him that those passages, therefore, lost all their force, because in reading a Paper of that nature people took it that the very latest figures were at their disposal. Then dealing with the figures of emigration, he said certain criticisms of them had been made. Mr. Crammond had stated that between 1861 and 1911 the net loss of the United Kingdom by emigration was just over 4 millions. As a matter of fact, according to the figures of the net passenger movement, if they took the years 1881 to 1911, they got almost precisely the same figure. If Mr. Crammond had been present he would have asked if there was a misprint, but in his absence he could only refer to the matter. It seemed to him that the emigration was the figure from 1881 to 1911. Then, turning to Germany, he did not understand how Mr. Crammond got the figure of net loss by emigration. The figures seemed to tally very closely with the gross emigration; and as Mr. Ellis Barker had pointed out, at the present time, at any rate, Germany had no emigration from a net point of view. Mr. Crammond's figures had also the objection that they threw no light on the position at the present day when they knew that, on the new basis of recording emigration, the emigration from the United Kingdom last year was 389,000, while Germany's emigration was under 26,000. Passing then to the question of trade figures, it seemed to him that the matter was most inadequately dealt with. To begin with, Mr. Crammond gave the figures of 1912; but the figures for 1913 were not only available but were most interesting, and even if Mr. Crammond had not had them in time to deal with them, he hoped he was not transgressing his rights in calling attention to them. Mr. Crammond's figure showed a total German trade of under 1,000,000,000*l.* sterling, but if they looked at the figures for 1913 the thousand-million level had been passed. Then criticising what Mr. Crammond had said with regard to the future progress of trade, he first of all did not agree with the lumping together of imports and exports. It might be defensible on some grounds, but it was not very useful from the point of view of trying to see into the future development of the two countries. It seemed to him that the great test was the test of exports. Whereas Mr. Crammond predicted that Germany would overtake us in total trade by 1920 to 1923, viewing the figures of exports in his opinion Germany was likely to overtake us possibly within the next five years. Then drawing attention to the table at the top of page 795, he said there was an attempt there to compare various categories of goods exported. It was perfectly true that Mr. Crammond sounded a warning-note that a strict comparison was impossible and was not given, but he could have gone farther than he had done. The Board of Trade for several years, since the introduction of the new German tariff, had very carefully given them the figure of German exports on the old basis. That old basis was more nearly comparable with the United Kingdom figure than was the present official German figure, and if Mr. Crammond had given them that figure, instead of the German figure for exports of manufactures being 260,000,000*l.* in 1911 it would be 275,000,000*l.*; and this difference of 15,000,000*l.* was not unimportant in view of the narrowing gap between British and German trade. He thought the fact that Mr. Crammond had converted his figures at 20 marks to the £ was unfortunate, in view of the fact that, when people read the Paper in conjunction with the very carefully prepared official statistics, they would find some disagreement owing to that. But he thought it all the more unfortunate in view of the fact that, as Mr. Crammond had stated, he had used that rate of conversion in one part of the Paper and a different rate in another. It seemed to him that on the ground of consistency alone it would have been better to adopt one course and keep to it.

Mr. Stamp said he would like to refer to the table on p. 803, giving the details of the total capital of the United Kingdom. This was a new computation upon an old model brought before the Society by Baxter fifty years ago, and repeated subsequently by Giffen, Goschen, Leone Levi and others; and as each person who took it up had a tendency to build upon previous work it was necessary to point out any errors at once, otherwise there was a risk that they might be perpetuated. The "number of years' "purchase" had rightly been revised, although he had not had an opportunity of examining it to see in what respect changes had been made. But attention should also be given to the two first columns. Under "Foreign and colonial securities and "coupons" there was an error of 10 millions, making 200 millions in the capital; and there seemed also to be a transfer of 10 millions between "other public companies" and "trades and professions," also affecting the total. But chief interest centred in the details below the income-tax line. If the estimate for unassessed profits was correct at 20 per cent. thirty years ago, it certainly was far too great to-day, and the figure suggested did violence to the findings of the recent commission on the subject. Then the "income from "non-taxpaying classes derived from capital" seemed to be put very high at 100,000,000*l*., when it was considered that 60,000,000*l*. already appeared in the figures above for exempt persons. Some failed to give reasons for the opinion that the unremitted income abroad, not assessed to tax, was also far too high. With regard to the estimate of capital sent abroad, on p. 798, a recent work by Dr. Hobson threw a considerable amount of light upon that point, and the figure should be criticised in accordance with the results of that investigation. On p. 797 the burden of the compulsory military system in Germany was referred to as an addition to taxation; but, of course, just as a money tax was paid out of a money income, so a non-money tax, if a burden on the country, reduced incomes in the first place, *i.e.*, had already come off before the aggregate income was computed, and could not be taken out of it. Hence the non-money tax could not be added to the existing taxes to be taken as a percentage of total income already reduced on account of it.

Mr. Flux said there were three points to which he would like to refer. Mr. Trachtenberg had commented on the figures of emigration given in the Paper; and although he had not had the opportunity of testing the methods Mr. Crammond had followed, the manner in which the figures were stated suggested that they were obtained by the method by which the Registrar-General, in his report on the decennial census, estimated net emigration from the census populations and the record of births and deaths in the intercensal periods. That was an entirely different basis from the record of the balance of passenger movement year by year, and it would not be remarkable if these two methods gave different results. He suggested that by way of a tentative defence in the absence of the reader of the Paper. Mr. Ellis Barker had made reference to the figures of agricultural production which Mr. Crammond gave. Incidentally he might say he did not discover in the Paper a bias in the direction that certain speakers had noted. Mr. Crammond did not tell them they might compare the figures he gave as the value of certain crops in Germany with the figures o the total saleable agricultural production of this country. Further, if they wanted to arrive at a figure for Germany which could be compared with the United Kingdom figure, they must not take in fodder crops, and also the meat and milk which were the products obtained by consuming these fodder crops. If they did that, they would most certainly get a vicious duplication. Therefore, in any comparison of figures taken as between the two countries, they must be very careful to avoid that duplication in the German figures which Mr. Rew had so carefully avoided in the English figures. Then, thirdly, there was the question of income, as to which Sir George Paish had been good enough to refer to himself. There he had a difficulty in understanding how the writer of the Paper had arrived at his figures. Mr. Crammond took into account the net output of the United Kingdom as shown by the Census Production for 1907. He then added certain other figures, and told them that the result was the product of 8,000,000 workers, or 1,000,000 more than the Census of Production covered. That was to say, the other million workers somehow had a product of 500,000,000*l.* sterling, which he could not understand. Then the Paper stated that there remained 8,000,000 of occupied persons. He would have supposed that something like 12,000,000 were left after taking 8,000,000 out of the occupied population, but he did not know how Mr. Crammond arrived at his figures. The process adopted appeared to him to be one which, however closely its conclusion might happen to agree with the estimates of the aggregate income of the United Kingdom obtained by other methods, was not capable of standing very close criticism of its details.

The following reply to the Discussion has been received from Mr. Crammond:—

With regard to Sir George Paish's point as to our total income from abroad in respect of interest, shipping and other services, I think he will find that the difference to which he referred was due to the fact that the figures relate to different years. The total of 375,000,000*l.* was the estimated income for 1913, and it was 35,000,000*l.* more than the estimate for 1912, owing to the increased earnings from shipping and the increase in the amount of our interest on investments abroad. Mr. Rozenraad is, doubtless, correct as to the strict interpretation of the term "Balance of "Trade," but I think he will find on reference to the Paper that due consideration was given to the earnings of shipping, the interest on capital invested abroad and to the other items that enter into the financial relations of Great Britain and Germany with the rest of the world. I have from time to time made careful inquiries as to the practicability of ascertaining the expenditure of British and German tourists outside their own frontiers, but there are no reliable data available. I am amused to notice that Mr. Ellis Barker has been able to trace a Free Trade bias running through my paper. As a matter of fact, for some years past I have been convinced that direct taxation in this country is rapidly approaching a dangerous limit, and that a point will soon be reached at which it will cease to be productive, and that a revision of our tariff has become necessary for the purpose of re-adjusting the burden of expenditure between the sources of direct and indirect taxation. In common with all students of German economics, I was perfectly familiar with the circumstances to which Mr. Ellis Barker refers as to migration from Germany, and the extent to which German agriculture is dependent upon alien labour. I appreciate the reasons which have induced Mr. Ellis Barker to dwell upon several minute points which are likely to support the views which he has so energetically expressed, but I did not feel justified in overloading my Paper with a mass of detail which really did not materially affect the general case which I endeavoured to present. I did not invite those who heard the Paper to accept the view that migration between Germany and England compared as 1 and 2. I merely stated the facts as they appear on page 15 of the Statistical Tables and Charts relating to British and Foreign Trade and Industry (1851–1908). (Cd. 4954.) The number of workers employed in German agriculture was taken from the figures given in the German census, which are quoted by Helfferich and others. I did not say that between 1882 and 1907 there was a shrinkage of 1,500,000 in the number of people employed in agriculture in Germany. The figures I gave showed that while there was an increase of 1,647,800 in the number of persons *employed*, there was a decrease of 1,544,000 in the number of persons employed *with their dependents*. Again, I did not invite my audience to conclude that the productiveness of agriculture in England and Germany compared as 2 and 5. I merely stated the facts as far as they had been authoritatively ascertained. Before sending in my Paper, I made careful inquiry in Germany as to whether any complete data existed as to the total value of the agricultural production of Germany, and I was informed that there was no estimate regarding the total of Germany's agricultural production. As I was particularly careful to point out that the German production of coal and lignite for 1911 included 74 million tons of lignite, and that the actual output of coal was for the United Kingdom 276,000,000 tons, and for Germany 160,500,000 tons, I am unable to follow Mr. Barker's statement that I did not know that lignite has a very inferior combustible value to coal. Notwithstanding Mr. Barker's statement to the contrary, I am still of opinion that the woollen industry of Germany has grown comparatively slowly. Does

Mr. Barker suggest that the home market in the United Kingdom has not expanded as well as that of Germany? Our woollen manufacturers are mainly affected by the development of Germany's exports of woollens, and if the German home demand continues to keep pace with the production, the competition of German woollen manufacturers will not affect us very seriously. Mr. Ellis Barker said that my statement that the deposits of the joint stock banks of the United Kingdom at the beginning of 1913 amounted to 1,053,000,000*l*. was a gross overstatement. These figures were taken from the Banking Supplement of the *Economist*, an authority which is universally accepted. In his eagerness to press this particular point Mr. Barker has quite ignored the fact that many hundreds of millions of British capital are deposited in the Anglo-Foreign and Anglo-Colonial banks which have their offices in London. Mr. Ellis Barker says that the amount stated to be deposited in the German credit banks, viz., 468,000,000*l*. is a gross understatement. These figures were taken from *Germany's Economic Progress and National Wealth* (1888–1913), Helfferich. There are no data available, so far as I am aware, for computing the deposits of the private banks. My statement with regard to the character of the business transacted with the German savings banks was based upon information supplied to me by a prominent London merchant who has an intimate practical knowledge of German banking. I feel that Mr. Trachtenberg's expression of regret that more up-to-date figures were not included in my Paper was in certain cases justified, but the Paper was prepared in the latter part of last year, and the latest figures then available were used. I venture to hope, however, that the figures which I have submitted convey on the whole a fairly accurate representation of the relative economic position of the two countries. Only those who have undertaken international statistical comparisons can fully appreciate the difficulties of the task, especially if one confines oneself to authoritative figures. As Mr. Flux was kind enough to suggest, my figures as to migration were obtained by the method by which the Registrar-General in his report on the decennial census estimates the net emigration from the census population and the record of births and deaths in the intercensal period. As stated above, the figures appear on page 15 of Statistical Tables and Charts (Cd. 4954). Mr. Stamp's criticism of the details of the estimate as to the total capital of the United Kingdom is very valuable, and I am glad to accept his corrections. I appreciate the force of the points raised by Mr. Flux in his courteous criticism with regard to my estimate of the national income, and I would only say that the result which I attained approximates very closely to his own scientific calculations and to the estimates of other authorities. Mr. Rosenbaum's criticism of the agricultural statistics is to some extent met by my reply to Mr. Ellis Barker. I should like to lay some emphasis upon the fact that the Paper was not one upon British and German Agriculture, but upon the economic relations of the two Empires, and agriculture was only touched upon incidentally. The points of detail to which Mr. Rosenbaum refers would be more appropriately dealt with in a comprehensive study of agriculture in the two countries. What I wished to convey was that the agricultural policy of Great Britain had differed widely from that of Germany and that this had resulted in a very great difference in the distribution of the national wealth in each case. As Mr. Rosenbaum's criticism of my figures with regard to the cotton industry of each country is largely a matter of opinion I do not propose to deal with it here. Mr. Rosenbaum's point as to the woollen industry has already been dealt with in my reply to Mr. Ellis Barker. I have not the first Fiscal Blue Book before me at the moment, but possibly the difference to which Mr. Rosenbaum directs attention is due to the fact that my figures relate to special trade, and the other figures to which he refers may possibly relate to general trade. Mr. Rosenbaum asks for some explanation as to the different estimates of the income from investments abroad. If he will glance at the Paper again, he will see that the estimate of 170,000,000*l.* relates to the year 1907, that of 185,000,000*l.* to the year 1912, and that of 190,000,000*l.* to the year 1913. Mr. Rosenbaum will also find that the estimate of 130,000,000*l.* as representing the earnings from shipping relates to the year 1913, while the estimate of 100,000,000*l.* relates to the year 1912. It would not be possible within the limits of a single Paper to include all the additional data for which Mr. Rosenbaum asks, but I may say that a detailed estimate of our income from abroad is furnished in my Paper upon "British Investments Abroad," which appeared in the *Quarterly Review* for July, 1911.

The following Candidates were elected Fellows of the Society:—

C. A. Bentley, M.B., D.P.H.	F. R. Blow.

REPORT OF THE COUNCIL

For the FINANCIAL YEAR *ended December* 31, 1913, *and for the* SESSIONAL YEAR *ending June* 16, 1914, *presented at the* EIGHTIETH ANNUAL GENERAL MEETING *of the* ROYAL STATISTICAL SOCIETY, *held at the Rooms of the Royal Society of Arts, John Street, Adelphi, London, W.C., on June* 16, 1914.

THE Council have the honour to submit their Eightieth Annual Report.

The roll of Fellows on December 31 last, as compared with the average of the previous ten years, was as follows :—

Particulars.	1913.	Average of the previous Ten Years.
Number of Fellows on December 31	846	877
Life Fellows included in the above	174	173
Number lost by death, withdrawal, or default	61	55
New Fellows elected	53	47

Since January 1 last, 32 new Fellows have been elected, and the Society has lost 26 by death, resignation, or default, so that the number on the list, excluding Honorary Fellows, on June 16, 1914, is 852, an increase of 12 over the previous sessional year.

The Society has to deplore the death, since June last year, of the following Honorary Fellows: Dr. Robert Meyer (Austria), Dr. Elis Sidenbladh (Sweden), and His Excellency Nicholas Tröinitsky (Russia), and of the undermentioned Fellows :—

		Date of Election.
d	Atkinson, Charles	1888
	Beresford, Frank	1910
	*Gray, Robert K.	1904
d p	*Ingall, William T. F. M.	1874
d	*Leadam, Isaac, M.A.	1883
d	Messenger, H. J.	1912

* Life Fellow.
d Donor to the Library.
p Contributed Papers to the Society's Transactions.

		Date of Election.
	Muirhead, Henry J.	1883
	Northampton, The Most Hon. the Marquess of	1889
	*Radstock, The Right Hon. Lord	1858
	Rivington, Francis H.	1892
d p	Robertson, J. Barr	1894
d	Russell, Hon. Francis Rollo	1910
	*Schlesinger, Louis G.	1904
	Stack, Thomas N.	1882
d	*Strathcona, The Right Hon. Lord, G.C.M.G.	1883
	Wallis, C. J.	1868
	Ward, W. C.	1893
	Worsfold, Rev. John N., M.A.	1878

* Life Fellow.
d Donor to the Library.
p Contributed Papers to the Society's Transactions.

The death-roll has been a less heavy one than during the preceding year, but the Society has to deplore the loss of one Honorary Fellow as against six last year, and of eighteen Fellows as against twenty-four last year. Among the latter is included the name of Mr. Charles Atkinson, who had been one of the Auditors of the Society's accounts continuously from 1895 to 1913. Mr. Atkinson, who was elected a Fellow of the Society in 1888, in addition to his voluntary work as an auditor on behalf of the general body of Fellows, showed a keen interest in the Society's welfare, and his services are gratefully remembered. Mr. William Ingall, who joined the Society in 1874, and Mr. J. Barr Robertson, who joined in 1894, had both been contributors to the Society's Transactions, as well as donors to the library. Mr. Isaac Leadam, Mr. H. J. Messenger, the Honble. Rollo Russell, and Lord Strathcona also manifested their interest in the Society by making presentations to the library, and in other ways.

Since June, 1913, the following new Fellows have been elected:—

Baker, John.
Beak, Charles W.
Bellman, Harold.
Bentley, C. A., M.B., D.P.H.
Bhargova, P. D.
Bispham, J. W., M.A.
Blow, Frederick R.
Brown, Archibald.
Burnett-Hurst, A. R., B.Sc.
De Jastrzebski, T. T. S.
Domingo, A. W.
Donie, Sir James M., K.C.S.I.
Eveleigh, F. W. A., A.S.A.A.
Fay, C. R.
Fidler, Walter.
Finch, Frank.
Fischer, Arne.
Floud, F. L. C.
Ghosh, Manmathanath, M.A.
Greenwell, Hubert.
Grisewood, H. J.
Hamilton, W. R.
Hazell, Walter, J.P.
Hirst, Hugo.
Hoogewerf, E., A.M.S.T.
Hooper, Alfred A. E.
Iyer, M. R. Sundaram.
Jones, David T.

Jones, E. S., A.I.A.
Kahn, Augustus, M.A.
Keeling, F. H.
Kolthammer, F. W., M.A.
Koren, John.
Lewinski, J. H., D.Sc.
Lightfoot, Gerald.
Machin, Stanley.
Morris, E. B.
Narayan, Lachmi.
Paterson, J. N.
Pease, A. F., J.P., D.L.
Peddie, J. T.
Pilling, A. B.
Read, A. Stanley.
Rietz, H. L., Ph.D.
Robertson, J. A.
Ruddle, F. C., F.S.I.
Salmon, H. C.
Shackel, T. W.
Soper, H. E.
Strong, Joseph, F.S.A.A.
Subedar, Manu, B.A., B.Sc.
Tattersall, F. W.
Thyagaraja Aiyar, V. R.
Tomlin, F. F., F.S.I., F.A.I.
Vaidya Raman, G. A., B.A
Varley, Benjamin.
Vos, Philip, B.A.
Wilkinson, W. F. S.
Young, Edward H.

The financial condition of the Society is shown in the Auditors Report appended hereto, the value of the invested stock held by the Society being taken at current prices. On January 1, 1913, there was a balance from 1912 of 37*l*. The receipts of the year were 2,108*l*., and the expenditure was 2,058*l*. While there is a decline of 49*l*. in the receipts, as compared with the previous year, it is satisfactory to note a decrease of 116*l*. in expenditure. It should, however, be remembered that during the present Session the calls upon the Society in respect both of the JOURNAL and of special inquiries, conducted under the direction of the Council, have been even heavier than during the previous year, and that a satisfactory balance cannot be expected at the end of the year unless the membership of the Society is maintained. A summary of the income and expenditure of the Society for the past twenty-five years will be found in Appendix B.

The thanks of the Council have been tendered to the Auditors for their honorary services.

The Papers read before the Society during the Session 1913-14 have been as follows:—

1913.

I.—November 18 .... WOOD, Mrs., B.Sc. The Course of "Real Wages" in London, 1900-1912.

II.—December 16 .... WILSON, Sir James, K.C.S.I. Co-operative Live-Stock Insurance in England and Wales.

III.—December 16 .... ROBERTSON, D. H. Some Material for a Study of Trade Fluctuations.

IV.—December 16 .... GREENWOOD, Dr. M., and YULE, G. Udny, M.A. The Determination of Size of Family, and Incidence of Characters in Order of Birth from Samples.

1914.	
V.—January 20	Dunlop, Dr. J. C. The Fertility of Marriage in Scotland: a Census Study.
VI.—February 17........	Baines, Sir J. Athelstane, C.S.I. The Census of the Empire, 1911.
VII.—March 17	Chapman, Prof. S. J., M.A., and Ashton, T. S. The Sizes of Businesses, mainly in the Textile Industries.
VIII.—April 21	Bowley, A. L., Sc.D. Rural Population of England and Wales. A Study of the Changes of Density, Occupations and Ages.
IX.—May 19	Hazell, Walter, J.P. Suggestions for recording the Life History and Family connections of Every Individual.
X.—June 16	Crammond, Edgar. Economic relations of the British and German Empires.

The cordial thanks of the Society are due to those who by the reading of papers, have maintained, in a high degree, the interest and value of the Society's Proceedings.

The additions to the Society's Library and the use made of it during the twelve months ending May 31, are shown in the statement given in Appendix C. The monthly average of books lent during the year ending May 31, 1914, was 50, and that of borrowers, 36. The total number of Fellows and others using the Library during the same period was 1,271, or an average of 106 persons per month.

The Special Committee appointed by the Council in 1912 to consider the question of morbidity and mortality statistics in the United Kingdom, which during the previous Session confined its labours to the preparation of a bibliography of the statistical data on the subject at present available in this country, was re-appointed by the Council. The Committee issued a preliminary report advocating the collection of hospital statistics by a central body on lines which met with the approval of the Council, and on the adoption of this report the Committee was empowered to approach the various authorities concerned, to prepare financial estimates if its suggestions were approved in principle, and to report further to the Council.

Another Special Committee was appointed by the Council on January 15 of this year, in response to a request from the Royal Commission on the Natural Resources, Trade, and Legislation of Certain Portions of His Majesty's Dominions, who had under consideration *inter alia* the question of migration of women from the United Kingdom to the self-governing Dominions. In order to assist the Commission to obtain an accurate statement of the number of women available in this country for emigration, the Council instructed the Special Committee to examine a memorandum already prepared for the Commission by Dr. E. C. Snow, and to report on the method there employed, and on such alternative methods as might appear to be suitable for arriving at the estimate required by the Commission of the number of women available for emigration:—

(1) Considering only the total population, without distinction of conjugal condition;
(2) Taking conjugal condition into account;
(3) Considering separately the numbers in rural districts, in industrial centres, and in residential neighbourhoods.

The Committee, which met under the chairmanship of Mr. Bernard Mallet, C.B., issued a detailed report which was communicated to the Commission. Upon the statistical evidence put forward the Committee arrived at the conclusion that, apart from the inference that there were now in the United Kingdom at least 143,000 more unmarried women than unmarried men between the ages of 15 and 35 who, in the light of recent experience might be expected to survive to and be unmarried at the ages 25–35, the issues referred to did not lend themselves to statistical analysis. At the same time, the Committee were agreed that the methods of investigation submitted by Dr. Snow and discussed in the Report were calculated to afford an approximation to a statistical measure of the available surplus.

The International Statistical Institute, with which the Society has always maintained cordial relations, decided at its last sessions to establish a permanent office and to publish a year-book of International Statistics under the general supervision of the Bureau of the Institute. In view of the importance of this attempt to collect and co-ordinate statistics of various countries—an object with which the Society has always been in sympathy—the Council have voted the sum of 100*l.* as a contribution towards the initial expenses of carrying out the scheme. The undertaking must necessarily be regarded at present as an experiment and it remains to be seen whether it can be successfully established on a permanent footing. It is understood that it will come up for review by the Institute at the next Session in 1915, but in the meantime the Council felt justified in giving the support of the Society to the project, to which the Statistical Society of Paris, the Economic and Statistical Society of the Netherlands and other institutions, as well as the Governments of certain European countries have already made contributions.

The Council received an invitation from the American Statistical Association to send a representative to take part in the proceedings for the celebration of their 75th anniversary. The Council requested Professor Wilcox, who has been a Fellow since 1901, to represent the Society on this interesting occasion, and to convey the cordial congratulations of the Society. The honorary membership of the American Statistical Association was conferred on a number of foreign statisticians, and the Council were gratified to note that those selected as representative of Great Britain were all members of their body, viz., Sir Athelstane Baines, C.S.I., Major Craigie, C.B., and Dr. A. Newsholme, C.B.

No award of the Howard Medal was made during the year 1912-13.

Under the conditions laid down in the regulations for the award of the Guy Medal, the Council have awarded a medal in silver to Mr. S. Rosenbaum for his Paper on the Trade of the British Empire, and for previous Papers read before the Society.

The following Fellows (nominated in accordance with By-law 14) are recommended for election as President, Council, and Officers of the Society for the Session 1914-15:—

PRESIDENT.

The Right Hon. Lord Welby, G.C.B.

COUNCIL.

Thomas G. Ackland, F.I.A.
William M. Acworth, M.A.
Percy Ashley, M.A.
Henry Birchenough, C.M.G., M.A.
Arthur L. Bowley, Sc.D.
Sir Edward W. Brabrook, C.B., Dir.S.A.
Professor S. J. Chapman, M.A.
Sir Ernest Clarke, M.A.
Sir Timothy A. Coghlan, I.S.O.
Geoffrey Drage, M.A.
Reginald Dudfield, M.A., M.B.
Alfred W. Flux, M.A
Major Greenwood, M.R.C.S.
William H. Hamer, M.D., F.R.C.P.
E. A. Hastings Jay, M.A., LL.B.
A. W. Waterlow King, J.P.
Professor Charles S. Loch, D.C.L.
Bernard Mallet, C.B.
Sir Shirley F. Murphy, F.R.C.S.
Sir Lesley Probyn, K.C.V.O.
R. Henry Rew, C.B.
Simon Rosenbaum, M.Sc.
Charles P. Sanger, M.A.
William N. Shaw, D.Sc., F.R.S.
T. H. C. Stevenson, M.D.
David A. Thomas, M.A.
Sir William J. Thompson, M.D.
Alfred W. Watson, F.I.A.
Sir James Wilson, K.C.S.I.
G. Udny Yule, M.A.

TREASURER.

Sir Richard Biddulph Martin, Bart. (*Hon. Vice-President*).

HONORARY SECRETARIES.

R. Henry Rew, C.B. (*and Foreign*). G. Udny Yule, M.A. A. W. Flux, M.A.

The abstract of the Treasurer's account of receipts and payments, and the estimate of assets and liabilities on December 31, 1913, together with the report of the Auditors on the accounts for the year 1913, are appended.

Signed on behalf of the Council,

F. Y. EDGEWORTH,
President.

R. H. REW,
G. UDNY YULE,
A. W. FLUX,
} *Hon. Secretaries.*

C. M. KOHAN,
Assistant Secretary.

APPENDICES TO ANNUAL REPORT.

A (i).—Abstract *of* Receipts *and* Payments *for the* Year *ending* December 31, 1913.

RECEIPTS.

	£	s.	d.	£	s	d.
Balance in Bank. Current Account, December 31, 1912	34	10	–			
Balance of Petty Cash	1	2	6			
,, Postage	1	7	8			
				37	–	2
Dividends on 2,371*l*. 6*s*. Consols, Account A	55	16	4			
Dividends on Consols, 10,527*l*. 12*s*. 3*d*., Account B (Guy Bequest)	247	16	8			
Dividend on G.N.R. Pref. Conv. 1,000*l*. Stock	37	13	4			
				341	6	4
Annual Subscriptions:—						
44 Arrears	92	8	–			
575 for year 1913	1,207	10	–			
15 in Advance for 1914	31	10	–			
—				1,331	8	–
634						
Compositions				84	–	–
"Journal" Sales				291	1	3
Advertisements in "Journal"				37	13	9
Library. R. Econ. Soc., &c. (2 years)				20	–	–
Total				£2,145	9	6

PAYMENTS.

				£	s.	d
Rent and Taxes:—						
Rent, less Tax	£357	16	8			
Taxes, 1912-13	41	3	4			
Total	399	–	–			
Less Sub-let (2 years)	50	–	–			
				349	–	–
Fire, Light, and Water				54	14	9
Furniture and Repairs				9	9	6
Salaries, Wages and Pension				632	1	–
"Journal," Printing and Paper	£592	2	–			
,, Shorthand Reporting	31	15	4			
,, Literary Services	47	3	9			
				671	1	1
Ordinary Meeting Expenses	27	9	–			
Advertising	29	6	3			
Postage and delivery of "Journals"	50	9	5			
Stationery and Sundry Printing	67	16	7			
Library	79	–	9			
Miscellaneous Expenses	76	1	2			
Medals	11	10	–			
				311	13	
				2,057	19	
Balance at Bank, December 31, 1913	£82	11	4			
Balance of Petty Cash	3	2	5			
,, Postage Account	1	13	3			
				87	10	
Total				£2,145	9	

(Signed) "S. Chapman,
"Henry W. Macrosty, } *Auditors.*
"J. Wilson,

"Richard B. Martin,
"*Treasurer.*

"*February* 3, 1914."

A (ii).—ESTIMATE *of* ASSETS *and* LIABILITIES *on* DECEMBER 31, 1913.

LIABILITIES.	£	s.	d.	£	s.	d.
arrison and Sons, for December "Journal"	86	2	6			
iscellaneous Accounts	205	16	4			
5 Subscriptions received in advance...	31	10	-			
				323	8	10
alance in favour of the Society (Exclusive of (1) Books in the Library; (2) Journals in Stock; and (3) Pictures, Furniture and Fixtures)				9,936	11	8
				£10,260	-	6

ASSETS.	£	s.	d.	£	s.	d.
Cash Balances				87	10	-
2,371*l.* 6*s.* Consols (General Fund). (Price, December 31, 1913, $71\frac{11}{16}$*l.*) ...	1,699	18	6			
10,527*l.* 12*s.* 3*d.* Consols (Guy Bequest). (Price, December 31, 1913, $71\frac{11}{16}$*l.*) ...	7,546	19	6			
1,000*l.* G.N.R. Preferred Converted Ordinary Stock. (Price, December 31, 1913, $84\frac{1}{2}$*l.*) ...	845	-	-			
				10,091	18	-
Arrears of Subscriptions recoverable (say 25)...............				52	10	-
Sundry debtors				28	2	6
				£10,260	-	6

A (iii).—BUILDING FUND (ESTABLISHED *July* 10, 1873): STATEMENT *of the* FUND *on* DECEMBER 31, 1913.

his Fund is invested in Metropolitan Consolidated 3*l.* 10*s.* per Cent. Stock. On December 31, 1912, the Fund was represented by 545*l.* 2*s.* 7*d.* of that Stock. With the dividends received during 1913, additional Stock to the value of 18*l.* 9*s.* 7*d.* was purchased by the Bank of England for the Society. Accordingly, on December 31, 1913, the total investment amounted to 563*l.* 12*s.* 2*d.* Stock.

(Signed)

"RICHARD B. MARTIN,
"*Treasurer.*

"S. CHAPMAN,
"HENRY W. MACROSTY,
"J. WILSON,
Auditors.

"*February* 3, 1914."

A (iv).—"REPORT OF THE AUDITORS FOR 1913.

"*The Auditors appointed to examine the Treasurer's Accounts for the Year* 1913,

"REPORT:—

"*That they have compared the Entries in the Books with the several Vouchers for the same, from January* 1 *to December* 31, 1913, *and find them correct, showing the* RECEIPTS (*including a Balance of* 37*l.* 0*s.* 2*d. from* 1912) *to have been* 2,145*l.* 9*s.* 6*d., and the* PAYMENTS 2,057*l.* 19*s.* 6*d., leaving a* BALANCE *in favour of the Society of* 87*l.* 10*s.* 0*d. on December* 31, 1913.

"*They have also had laid before them an Estimate of the Assets and Liabilities of the Society at the same date, the former amounting to* 10,260*l.* 0*s.* 6*d., and the latter to* 323*l.* 8*s.* 10*d., leaving an excess of Assets over Liabilities of* 9,936*l.* 11*s.* 8*d., exclusive of* (1) *Books in the Library;* (2) *Journals, &c., in Stock; and* (3) *Pictures, Furniture, and Fixtures.*

"*They have verified the* INVESTMENTS *of the Society's General Funds* (2,371*l.* 6*s. Consols and* 1,000*l. G.N.R. Stock*)*; the Guy Bequest* (10,527*l.* 12*s.* 3*d. Consols*)*; the Building Fund* (563*l.* 12*s.* 2*d. Met. Cons. Three and a half per cent. Stock*)*; and also the Banker's Balance* (82*l.* 14*s.* 4*d.*)*; all of which were examined and found correct.*

"*They further find that at the end of the year* 1912 *the number of* FELLOWS *on the list was* 854, *which number was* REDUCED *in the course of the year to the extent of* 61, *by Death, Resignation, or Default; and that* 53 *new Fellows were* ELECTED *or restored to the list, leaving on the list on December* 31, 1913, 846 *Fellows of the Society, of whom* 174 *were compounders.*

(Signed) "S. CHAPMAN,
"HENRY W. MACROSTY, } *Auditors.*
"J. WILSON.

"*February* 3, 1914."

B.—*Statement of the Condition of the Society in the last Twenty-five Years* 1889-1913.

Year.	Number of Fellows on December 31.	Number of Life Fellows included therein.	Losses during Year by Deaths, &c.	Gains by Election, &c., during Year.	Income from					Expenditure.			Amount Invested on December 31.	Year.
					Annual Subscriptions.	Compositions	Journal Sales.	Investments and other Sources.	All Sources.	Total.	Of which On Journal.	Of which On Library		
					£	£	£	£	£	£	£	£	£	
1889....	1,060	175	69	70	1,678	126	229	82	2,115	2,060[f]	623	146	2,500	1889
1890....	1,063	177	65	68	1,764	84	155	94	2,097	2,096[a]	567	68	2,900	1890
'91....	1,019	172	80	36	1,707	42	146	181	2,076[g]	1,957[h]	582	172	2,900	'91
'92....	994	171	70	45	1,634	84	158	104	1,980	1,883[i]	539	94	2,900	'92
'93....	964	176	66	36	1,560	124	128	92	1,904	1,921	578	63	2,900	'93
'94....	933	180	67	36	1,491	105	152	82	1,830	1,904	649	75	2,900	'94
'95....	928	180	59	54	1,468	63	180	82	1,793	1,823[j]	576	56	2,900	'95
'96....	910	181	48	30	1,478	42	168	84	1,772	1,787	571	44	2,900	'96
'97....	892	182	58	40	1,472	145	157	83	1,857	1,986[k]	650	50	2,900	'97
'98....	878	180	57	43	1,451	115	182	105	1,853	1,825	609	55	3,300[l]	'98
'99....	896	181	44	62	1,432	95	167	127	1,821	1,805	564	33	3,300	'99
1900....	923	179	36	63	1,514	21	189	148	1,872	1,817	521	53	3,300	1900
'01....	926	177	49	52	1,464	63	211	129	1,867	1,823	518	42	3,300	'01
'02....	932	177	52	58	1,504	21	255	152	1,932	1,839	543	73	3,300	'02
'03 ..	939	174	49	56	1,517	84	293	151	2,045	1,875	593	91	3,300	'03
'04....	925	175	58	44	1,407	124	253	152	1,936	1,931[a]	521	92	3,100	'04
'05....	911	178	59	45	1,465	168	220	220	2,073	2,074[m]	665	67	11,975[n]	'05
'06....	891	177	63	43	1,464	82	225	408	2,274[o]	1,988	645	95	11,449	'06
'07....	861	172	63	33	1,363	82	327[q]	408	2,180	2,401[p]	571	87	11,746	'07
'08....	855	170	46	40	1,339	84	254	494[r]	2,171[r]	2,428[s]	602	92	11,920	'08
'09....	825	167	82	52	1,307	84	273	396	2,060	2,369	611	99	12,084	'09
1910....	845	172	37	57	1,304	141	326	974[t]	2,746[t]	2,726[u]	803	74	11,210	1910
'11...	867	174	40	62	1,415	126	308	405	2,255	2,372[v]	721	104	10,875	'11
'12....	854	175	57	44	1,336	105	334	382	2,157	2,174	776	81	10,599	'12
'13....	846	174	61	53	1,331	84	294	399	2,108	2,058	671	79	10,092	'13

[a] Includes purchase of Government stock.
[f] Includes cost of part iv of Index to *Journal*.
[g] Includes Mrs. Lovegrove's legacy of 100*l*.
[h] Includes outlay for Guy Medal and for binding "The Times."
[i] Includes outlay for drainage repairs.
[j] Includes cost of Subject-Index to *Journal*.
[k] Includes cost of doing up interior of premises.
[l] Includes 400*l*. G.N.R. Stock, purchased with Mr. J. Heywood's Legacy of 500*l*.
[m] Includes 100*l*. to International Statistical Congress Fund.
[n] Includes the Guy Bequest. The total invested is now valued at current prices.
[o] Including 126*l*. for sale of books.
[p] Includes purchase of 600*l*. G.N.R. Stock.
[q] Includes special sales.
[r] Includes Sanford Bequest, 100*l*.
[s] Includes 160*l*. for Catalogue and 288*l*. for purchase of Stock.
[t] Includes 500*l*. from sale of Consols and 68*l*. Income-Tax refunded.
[u] Includes 436*l*. for re-decoration of premises, installing electric light and furniture.
[v] Includes 169*l*. for furniture and carpets and "at home" expenses.

C.—*Numbers of Books Added to the Library and Lent, and Numbers of Borrowers from the Library in the Sessional Years* 1911-12, 1912-13, *and* 1913-14.

Months.	Works Received.*			Books Lent.						Borrowers.			Fellows and Visitors using the Library.					Months.
	1911-12.	1912-13.	1913-14.	1911-12.		1912-13.		1913-14.		1911-12.	1912-13.	1913-14.	1911-12.	1912-13.	1913-14.	Called after 5 p.m. or remained after 5 p.m.		
				Works.	Vols.	Works.	Vols.	Works.	Vols.							1912-13.	1913-14.	
1913.																		1913.
July	988	830	740	34	46	61	72	58	75	23	35	37	76	101	134	—	—	July
August	—	—	—	52	59	51	54	17	17	32	31	11	72	81	67	—	—	August
September	—	—	—	35	49	54	65	42	64	22	31	27	55	90	109	—	—	Sept.
October....	—	—	—	77	84	91	117	62	76	48	60	50	130	123	148	19	37	October
November	—	—	—	69	95	55	68	30	38	44	37	26	153	101	102	19	36	Nov.
December	249	310	311	60	75	72	81	81	99	37	45	49	85	142	99	41	24	Dec.
1914.																		1914.
January	68	55	97	100	130	56	60	60	72	61	34	48	113	112	116	21	24	January
February ...	62	66	67	93	121	44	73	53	60	62	28	33	131	137	106	41	22	February
March	82	82	73	86	98	56	80	49	74	49	33	42	140	134	107	35	21	March
April........ ...	61	36	71	101	111	72	88	57	64	55	40	38	128	108	74	22	13	April
May	97	111	85	63	73	62	76	51	77	41	34	34	132	166	96	49	17	May
June	62	50	—	53	67	40	46	—	—	26	32	—	129	113	—	20	—	June
Sessional year....	1,669	1,540	—	823	1,008	714	880	—	—	500	440	—	1,344	1,408	—	267	—	Sessional year
Monthly average	139	128	—	68	84	59	74	—	—	42	36	—	112	117	—	29	—	Monthly average

* These figures represent the number of works entered during the year, under "Additions to the Library," in the *Journal*, and not the number of separate volumes; they are exclusive of about 170 weekly, monthly, and quarterly periodicals regularly received.

PROCEEDINGS *of the* EIGHTIETH ANNUAL GENERAL MEETING, held on June 16, 1914.

The President, Professor F. Y. EDGEWORTH, M.A., F.B.A., in the Chair.

The PRESIDENT moved that the Report of the Council, the Abstract of Receipts and Payments, the Estimate of Assets and Liabilities, and the Report of the Auditors be adopted, entered on the Minutes and printed in the *Journal.*

Sir ATHELSTANE BAINES seconded the motion, which was put to the meeting and carried unanimously.

The Ballot for the election of the President, Council and Honorary Officers for the session 1914-15 was then taken, and the Scrutineers (Mr. R. H. FELLOWS and Mr. J. W. NIXON), reported that they had been unanimously elected.

The HON. SECRETARY having read out the list of defaulters, the President declared that they had ceased to be Fellows of the Society.

The PRESIDENT announced that the Council and Officers proposed had been duly elected.

Mr. J. C. STAMP moved a cordial vote of thanks to the President, Council and Officers for their services during the past year.

Mr. C. P. C. KAINS-JACKSON seconded the motion, which was carried unanimously.

ON THE USE OF ANALYTICAL GEOMETRY TO REPRESENT CERTAIN KINDS OF STATISTICS.

By Professor F. Y. EDGEWORTH, M.A., F.B.A.

(*Continuation and conclusion.*)

SECTION III.—FREQUENCY-SURFACES.

IN the preceding sections two methods have been employed to construct a representation of the frequency with which the different sizes of a variable organ or attribute occur. The methods which have been described with reference to a single variate and the frequency-curve thereto pertaining are now to be extended to several variates with frequency denoted by a surface (or a locus in space of more than three dimensions). The relegation of the general case to a separate section is not grounded only on its greater complication. The frequency-surface differs from the frequency-curve not merely in dimension, but also in the possession of an additional and remarkable feature. The surface is, indeed, analogous to the curve so far as the ordinate of each represents frequency. For as the ordinate of the curve, say y, represents the frequency with which particular values of the variate x (or rather values in the close neighbourhood of any assigned value of x, say between x and $x+\Delta x$, or $x-\frac{1}{2}\Delta x$ and $x+\frac{1}{2}\Delta x$) occur; so the ordinate of the surface, say z, represents the frequency with which particular values of the variates, say x and y (or values in the immediate neighbourhood) concur. But there is a further property presented by the surface. To any assigned value of one of the variates, say x, there corresponds a particular value of the other variate y, namely, the Mean of all the y's which in the long run occur along with the assigned x (or more generally there corresponds a particular value for a *frequency constant* pertaining to the y-curve formed by a plane section of the surface, through the assigned point on the axis of x, parallel to the plane yz). In virtue of this property when the surface is normal the theory of error has a corollary which is perhaps more important than the main proposition; more interesting theoretically and more useful in practice. The surface, indeed, as the representative of frequency presents equally with the curve the marvel of law emerging from chance—the law of error or normal variability. But the relation between the value of any one co-ordinate x to the mean of the y-"array" associated therewith presents that marvellous phenomenon more strikingly; the relation being the simplest and most familiar of all quantitative relations, that which is expressed by an equation of the first degree, or a right line. Moreover a knowledge of a law connecting the size of one variate with the probable size of another variate cannot fail to be of great scientific value, even when the relation is not linear, the normal law not being fulfilled. Correlation, as conceived by

Professor Pearson, is exalted even above causation.* The importance of the principle is illustrated by the liveliness of the controversies which it excites.

Let us, avoiding controversy, approach the subject dispassionately by at first treating the frequency-surface as merely analogous to the frequency-curves which have been dealt with in the preceding sections. It will be remembered that in order to obtain a curve representative of statistics relating to a single variate it was proposed to "translate" a normal error-curve by shifting each element with altered base and height to a new position. We are now to suppose a normal surface with unit constants of dispersion to be analogously translated so as to represent a given group of statistics relating to two variates. The problem would be very simple if the given group might be considered as belonging to the kind of surface which Dr. Sheppard has called "projective," its equation being of the form $z = \mathrm{N}f(x) \times f(y)$ (where N is the total number of observations). For then we may treat each of the curves $z = \mathrm{N}f(x)$, $z = \mathrm{N}f(y)$ separately by one of the methods set forth in the preceding section; and by means of the two operations thus obtained shift any element of the generating normal surface (by hypothesis, of the projective sort), say the column with height ζ standing on base $\Delta\xi\Delta\eta$, so as to represent a column of the given "histogram." The case next in the order of simplicity is that in which the translations are of the simple kind thus described, while the generating normal surface is not projective, but has a coefficient of correlation r. It is still open to us to obtain a curve in the plane of xz by summing-up all the observations which have the same x, which we will call the x-curve; and likewise to obtain a curve of frequency for y separately, the y-curve. Thus translating operators may be obtained for each of these curves separately.

We thus easily obtain the operators; but in order to perform the operation we require also the operand, the generating normal surface. It is not enough to know that the constants of dispersion for each of the variables pertaining to that surface are units; we require also to know the coefficient of correlation, r. To obtain this coefficient some additional datum must be utilised. Such a datum is presented by the "product-moment" Σxy (the co-ordinates x and y being measured from the centre of gravity and the summation extending over the whole group); provided that the given observations occur at such short intervals as to fulfil a condition analogous to that which was postulated for the Method of Moments.† This datum, which may be called μ_{12}, is connected by a simple relation with the translation-constants pertaining respectively to the x-curve and the y-curve, which as just now observed may be separately constructed. Let the two operators ascertained by the Method of Moments described in our first section be respectively

$$\mathrm{X} = a\,(\xi + \kappa_1\xi^2 + \lambda_1\xi^3),$$
$$\mathrm{Y} = b\,(\eta + \kappa_2\eta^2 + \lambda_2\eta^3);$$

---

* "Variation and correlation include causation and determinatism as special cases." *Grammar of Science*, third edition, p. 177 and context.

† *Ante*, p. 724.

where ξ is the abscissa (measured from the centre) of an error-curve with unit *modulus*, η is the ordinate. Then it may be shown that $\mu_{12} = ab\{\frac{1}{2}r + \kappa_1\kappa_2\frac{1}{4}(1 + 2r^2) + (\lambda_1 + \lambda_2)\frac{3}{4}r + \lambda_1\lambda_2(\frac{9}{8}r + \frac{3}{4}r^3)\}$.* In this expression

$$a = \sqrt{2\mu_2}\Big/\sqrt{1 + \chi_1 + 3\lambda_1 + \frac{15}{4}\lambda_1^2},$$

$$b = \sqrt{2\mu_2'}\Big/\sqrt{1 + \chi_2 + 3\lambda_2 + \frac{15}{4}\lambda_2^2};$$

where μ_2 is the mean square of deviation for the x-curve, μ_2' for the y-curve, $\chi_1 = \kappa_1^2$, $\chi_2 = \kappa_2^2$. We can then equate the product sum referred to the standard deviations, $\mu_{12}/\sqrt{\mu_2\mu_2'}$, the apparent correlation as we may call this datum, to a known function of r. The cubic equation thus obtained for r may be written

$$\tfrac{3}{2}\lambda_1\lambda_2 r^2 + \kappa_1\kappa_2 r^2 + (1 + \tfrac{3}{2}(\lambda_1 + \lambda_2) + \tfrac{9}{4}\lambda_1\lambda_2)r = \frac{\mu_{12}}{\sqrt{\mu_2\mu_2'}}\sqrt{g_1g_2} - \tfrac{1}{2}\kappa_1\kappa_2;$$

if $g_1 = 1 + \chi_1 + 3\lambda_1 + \frac{15}{4}\lambda_1^2$, and g_2 is similarly related to χ_2, λ_2. The reader will remember that the χ's and λ's in this formula are those which are based on the supposition that the generating normal surface has unit *modulus* for each variate. If in accordance with the present fashion the *standard deviation* is taken as the constant of dispersion which is to be treated as a unit, it will be proper to substitute in the above formula, for each λ and χ, 2λ and 2χ, and for $\kappa\kappa_2$, $2\kappa_1\kappa_2$.

One or two examples will, I think, be preferable to further explanations. My first example is taken from Professor Pearson's fourteenth "Contribution," which deals with "Skew Correlation." †

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* See Congress Paper (*Proceedings of the Congress of Mathematicians*, Cambridge, 1912, vol. ii, p. 438), Section V; where there is a serious misprint, not to say *lapsus calami*, "r" being put for "$\frac{1}{2}r$," the integral between extreme limits of the $\xi\eta\zeta$, where ζ is the ordinate of a normal surface and ξ and η are variates each referred to its modulus as unit. It may be well to explain that in obtaining the integrals of products such as $\xi\eta$, $\xi^3\eta$, $\xi^3\eta^3$ (multiplied by ζ), I have transformed to principal axes by putting $\xi = X\cos\theta - Y\sin\theta$ and $\eta = X\sin\theta + Y\cos\theta$ where $\cos\theta = 1/\sqrt{2} = \sin\theta$. Thus $\iint\xi\eta\zeta d\xi d\eta$ (limits of each integration $\pm\infty$) is transformed to

$$\iint dX\,dY\frac{X^2 - Y^2}{2}\frac{1}{\pi(1 - r^2)}exp - \frac{X^2}{1 + r} - \frac{Y^2}{1 - r}$$

(between limits $\pm\infty$), where X and Y are *independent* variates with modulus $\sqrt{1 + r}$ and $\sqrt{1 - r}$ respectively. By a well-known formula the transformed integral is equal $\frac{1}{2}\{\frac{1}{2}(1 + r) - \frac{1}{2}(1 - r)\} = \frac{1}{2}r$. Likewise the integral (between extreme limits) of $\xi^3\eta^3\zeta$, becoming transformed to

$$\iint dX\,dY\frac{(X^2 - Y^2)^3}{8}\frac{1}{\pi(1 - r^2)}exp - \frac{X^2}{1 + r} - \frac{Y^2}{1 - r},$$

is found to be $\frac{9}{8}r + \frac{3}{4}r^3$. The coefficients of κ_1, κ_2 $(\lambda_1 + \lambda_2)$, in the expression for μ_{12}, are similarly evaluated. (X and Y in this note, I need hardly say, have not the same meaning as in the text.)

† Drapers' Company Research Memoirs. *Biometric*, Series III.

His "Illustration B," on the correlation between *age* and *head-height* in girls, gives the following constants for the separate curves representing respectively the frequency of ages (x) and of head heights (y):—

	x.	y.
β_1	·001335	·015960
β_2	2·710593	3·081450.

Also the coefficient corresponding to that which we have just called the apparent correlation (his "r") is ·294,128. From the given values of the β's I obtain, in my notation—using dots to designate coefficients pertaining to the y-curve—

$$\beta\left(=\frac{1}{8}\beta_1\right) = 0 \qquad \epsilon\left(=\frac{1}{12}(\beta_2 - 3)\right) = -0241$$
$$\dot{\beta} = \cdot 002 \qquad \dot{\epsilon} = \cdot 007$$

Whence, for the x-curve we have $\chi_1 = 0$. λ_1 is found from a formula of approximation given in our first section to be $-\cdot 0261$. For the y-curve we may employ the formulæ proper to slightly abnormal curves. Whereby I find $\lambda_2 = \cdot 0052$, say ·005, and corresponding to that value of λ, $\chi_2 = 00088$, say ·001.

These values of the constants are now to be substituted in the equation for r. For g_1 I find ·9242 ; for g_2, 1·016 ; for $\sqrt{g_1 g_2}$, ·969. Effecting the other substitutions, I find—

$$\cdot 969 \times \cdot 294 \ldots = \cdot 968r - 0002 \times r^3.$$

Thus the sought r, the correlation coefficient of the generating normal surface, is practically identical with the apparent correlation (·294 . . .). What difference there is consists in the *diminution* of the product-moment by the process of translation. This result is in accordance with the incident that the most serious strain to which the hypothetical normal surface has suffered has been in the way of flattening, *platy-kurtosis.*

We have now determined both the operator and the operand. It remains only to ascertain the point at which the operator is to be applied, the Median. Its co-ordinates are to be determined from the x-curve and the y-curve separately upon a principle explained in the last section. For x (denoting ages) we have, out of 2,272 observations in all, 1,023 above 13 years, 940 below 12 years, 309 between 12 and 13. The distance on the axis of the generating normal curve to the point on that curve which corresponds to the age 13, the distance denoted ξ_1 in the passage referred to, is ·1256, as determined with reference to another purpose to which we are coming.* Likewise the distance ξ_{-1} corresponding to the distance of the Median from the age 12 proves to be ·218. Therefore, dividing the interval 12—13 in the proportion ·218 : ·1256, we obtain for the Median 12·634. The Median height is similarly ascertained.

Other examples are furnished by Professor Pearson's remaining illustrations. But they are, I think, less suited to the Method of Moments which we are now exemplifying than to the Method of Percentiles which is to follow; owing to the remarkable degree of *platy-kurtosis* which they present. For instance, in Illustration A the coefficient β_2 for the x-curve is 1·8288 nearly. Whence $\eta = (\beta_2 - 3) = -1·1712$, and $\epsilon (= \eta/12) = -·097$ nearly; while β_1 is small $= ·0021$. Now this implies a degree of *platy-kurtosis* unfavourable for the use of Moments, if not indeed fatal to any kind of translation.* Illustration C presents the same kind of abnormality in a much aggravated degree. In Illustration D, too, the x-curve appears to belong to the class which we have called very abnormal,† a class unsuited for the calculation of the correlation as here conceived by way of the product-moment. The translation-constants may no doubt be determined by the method of *percentiles* which has been given in the preceding section; and the correlation coefficient by the method which will be given in this section, not requiring the use of *moments*.

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* Below, p. 851.

I take a second example from Professor Pearson's statistics relating to barometric heights at Southampton and Laudale.‡ Designating the former as x, the latter as y, we have the following frequency-constants:—

	x.	y.
β_1	·1226	·21973
β_2	3·36529	3·19784
β	·0153	·02747
ϵ	·0304	·0165

For the product-moment referred to standard-deviations (our *apparent* correlation) ·78.§

Using the second approximations given under the head of "slightly abnormal curves" in the first section, I find—

$$\lambda_1 = ·016 \qquad \lambda_2 = -·0083$$
$$\chi_1 = ·0066 \qquad \chi_2 = ·0125$$

We have thus $\lambda_1 + \lambda_2 = ·0077$, $\lambda_1\lambda_2 = -·000133$, $\kappa_1\kappa_2 = \sqrt{\chi_1\chi_2} = ·009$, $g_1 = 1·0556$, $g_2 = ·9879$, $\sqrt{g_1 g_2} = 1·02$. Substituting these values in the equation for r, we have

$$1·02 \times ·78 - ·0045 = 1·0112r + ·009r^2 - 00015r^3.$$

The first approximation gives the value of r a little *greater* than the gross correlation, viz., about ·782. But the second approximation reduces the value of r to below ·78, to about ·777. And the third approximation does not materially increase this result.

It remains only to find the position of the Median, which can be effected without difficulty by the method above described.

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* *J.R.S.S.*, *ante*, p. 669. The ϵ in the case before us almost at the limit $-·1 + \frac{32}{45}\beta$, at which translation breaks down.

† *Loc. cit.*

‡ *Phil. Trans.*, 1897, vol. 190, p. 431.

§ Given by Professor Pearson, *Biometrica*, IX, p. 223, as the result of applying Sheppard's corrections to the value given in the earlier memoir.

I have similarly treated the correlation between the barometric heights of Babbacome and Churchstoke; but the very high degree of correlation, almost unity, makes the instance one not well suited for the purpose of illustration.

It will be remembered, of course, that the proposed method is only available on condition that the data correspond to the underlying hypothesis as to the character of the translation: the supposition that each "array" translated moves perpendicular to one co-ordinate and parallel to another, without wheeling of the line or breaking of the rank. Otherwise it would be proper to regard the displacement of any element of the frequency-surface in the direction of one of the axes, say x, no longer as a function of the co-ordinate x only but as dependent also on y. Statistics given by Professor Pearson,* showing that much the same correlation coefficient is obtained by his method from different subdivisions (into four portions) of certain frequency-groups, seem to justify the assumption that for those kinds of groups at least our hypothesis is adequately fulfilled. Otherwise it would be proper to employ a more complicated sort of strain than that which has been described; and to utilise additional data in order to determine a greater number of coefficients. I have elsewhere entertained the possibility of this construction.† It is much simplified by the supposition that the difference between the sought and the apparent correlation (in the symbols which we have employed $\mu_{12}/\sqrt{\mu_2\mu_2'}$) is a relatively small quantity. This supposition appears to be countenanced by the examples of the simple translation which I have worked.

I leave it to better arithmeticians to test the suggestions which I have made. Nor do I exemplify the application of the method to cases with more than two variates, requiring for the representation of frequency at least *four* co-ordinates, in space of more than three dimensions. I point to worlds beyond our space, but do not lead the way.

I return to the simpler scheme, and proceed to show how to carry it out when the data are not sufficiently detailed to allow of the product-moment being ascertained. Not thin columns, but only large blocks of frequency now are given; analogous to the data respecting a single variate to which in the preceding section we applied the Method of Percentiles. As there we ascertained a required frequency-constant, *e.g.*, the modulus, by expressing as a function of that coefficient the probability that the given set of percentiles would have resulted from an assumed Modulus, and finding the value of the sought coefficient for which that probability is a maximum, so now we proceed with the coefficient r. The most probable value of that coefficient is given by minimizing an expression of the form

$$\frac{E_1^2}{U_1} + \frac{E_2^2}{U_2} \cdot \cdot \cdot + \frac{E_n^2}{U_n};$$

---

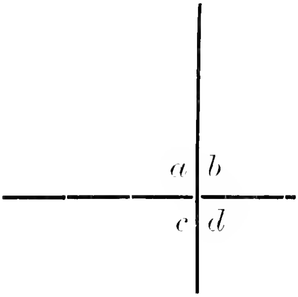
* *Biometrica*, IX, p. 262 *et seq.*

† Congress Paper, Section V.

where E_t is the difference between the actual solid content of frequency standing on any one of the few large compartments into which the area of the plane xy is sub-divided, and the content which would be presented if r were the true coefficient; U_t is the theoretical frequency of the tth compartment. The compartments are supposed to be formed by straight lines parallel to the axes of x and y in the plane of xy (with planes passing through those lines perpendicular to the plane of xy). The boundary lines are sometimes at an infinite distance, or at least outside the sensible portion of the surface. A compartment which has two such indefinite boundaries may be described as a "corner" compartment; for instance, I or II in Fig. 16.

Let us begin by supposing that the separate curves for x and y are perfectly normal; and accordingly that κ and λ are zero for both curves. Then a and b are respectively identical with σ_x and σ_y; if we take the *standard-deviation* of the generating normal surface to be unity. Let d be a corner compartment of which the boundary lines produced beyond their point of intersection include the Median between them as in Fig. 14, where $a + b > c + d$ and $a + c > b + d$.

FIG. 14.



Then we may put for E_d the difference between the actual proportion of observations in the compartment and the value thereof which Professor Pearson found by a brilliant investigation* for the content of a compartment formed by a fourfold division of a normal frequency-surface. In his notation, if d is the actual number of observations in the compartment of a fourfold table, such as that represented in our Fig. 14, then for the proportion d/N (where N is the total number of observations) we have the equation—

$$\frac{d}{N} = \frac{b+d}{N}\frac{c+d}{N} + HK\left\{r + \tfrac{1}{2}hkr^2 + \tfrac{1}{6}(h^2-1)(k^2-1)r^3 + \ldots\right\}$$

where h is the distance, as with reference to our construction it may be said, from the centre of the generating normal surface with unit constants of dispersion to the line parallel to the axis y which in

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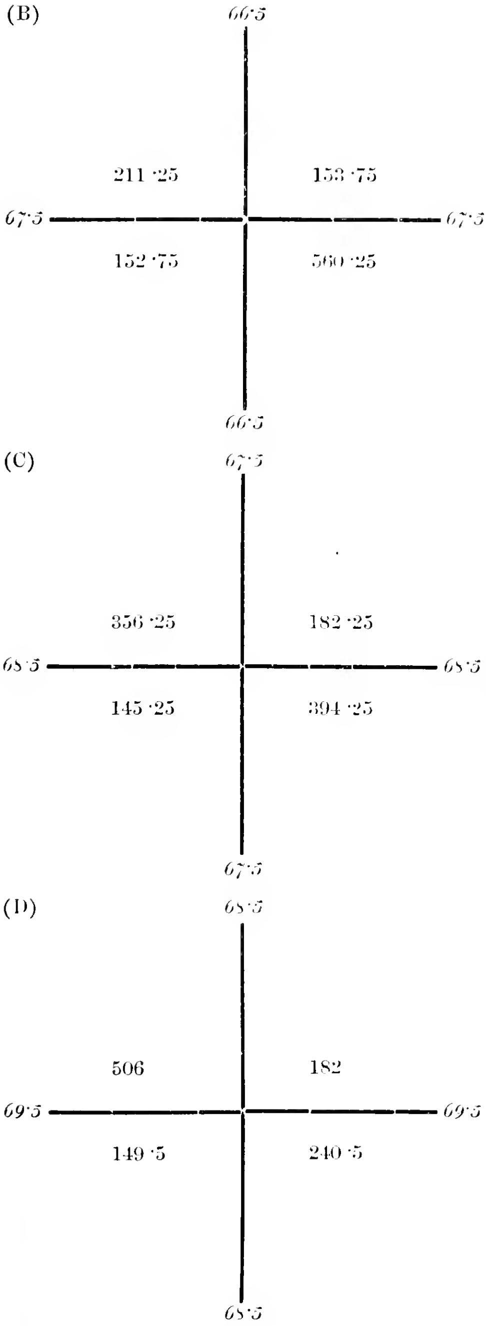
* *Transactions of the Royal Society*, 1900, Vol. 195A (' Contribution" VII.)

Fig. 15.


(B)
66·5
211·25
153·75
67·5
67·5
152·75
560·25
66·5
(C)
67·5
356·25
182·25
68·5
68·5
145·25
394·25
67·5
(D)
68·5
506
182
69·5
69·5
149·5
240·5
68·5

Each vertical line divides fathers *above* a certain height on the *right* of the line from fathers below that height on the left. Each horizontal line divides sons *above* a certain height *below* the line from sons below that height above the line.

the translated surface rules off a proportion of the total frequency-group equal to $\frac{b+d}{N}$.* Likewise k is the ordinate (measured downwards) corresponding to the horizontal line which has the proportion $c+d$ below it. H is the ordinate of the normal curve corresponding to the abscissa h, and K is similarly related to k. Thus, putting for $\frac{d}{N} - \frac{b+d}{N}\frac{c+d}{N}$, $\frac{ad-bc}{N^2}$ $(N = a+b+c+d)$, or more shortly δ, we have—

$$E = HK\{r + \tfrac{1}{2}r^2 + \tfrac{1}{6}(h^2-1)(k^2-1)r^3 + \ldots\} - \delta.$$

Whence for $\frac{d}{dr}E^2$, being one of the constituents of the expression which is to be minimised, we have—

$$Hk\{\ \ldots\ \tfrac{1}{2}(h^2-1)(h^2-1)r^2 + r + 1\}\ [Hk\{\ \ldots\ \tfrac{1}{2}r^2 + r\} - \delta];$$

omitting for brevity, not as in general negligible, terms involving powers of r higher than the second. The expressions for E may similarly be found for any analogous corner quadrant. From the results obtained for corner quadrants we may deduce the expression for E proper to any *interior* compartment by a simple subtraction.

An example will make clear my meaning. I take one as usual from Professor Pearson; to whom my constructions are much indebted, not only for architectural designs, but also for building materials. My example is taken from the fifth illustration in the memoir to which I have referred; exhibiting correlation between the stature of fathers and that of their sons. Of the data adduced by Professor Pearson I shall utilise only *three* divisions of the total group, those designated by him (B), (C) and (D).† In Fig. 15 I reproduce the materials given by Professor Pearson in the form of fourfold tables. In the fourfold table labelled by him (D) I designate as D the compartment to the right of the vertical line and below the horizontal, the quadrant at the lower right corner, comprising fathers of height above 68·5 inches and sons of height above 69·5 inches. In the fourfold table labelled (C) I take for C the left hand upper quadrant, comprising fathers of height below 67·5, sons of height below 68·5. In (B) the left hand upper quadrant, which I designate B, denotes fathers below 66·5, and sons below 67·5—a class included in the preceding one. Using the values of h and k, which he has given, for the determination of r from the compartments D, C and B separately,‡ I have deduced for each of the three compartments, with the aid of Dr. Sheppard's Table II, the respective values of H and K. The contents of each fourfold table furnish data for calculating U and δ. I thus construct the first part of Table XI consisting of primary data or half-manufactured materials; from which the E's for the three compartments can be found by the formula above given.

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* In short, h is in the case supposed identical with our ξ, k with our η.

† *Loc. cit.*, pp. 40, 41.

‡ *Loc. cit.*, p. 42.

(1) TABLE XI.

	h.	k.	H.	κ.	δ.	U.
C	·0873	·00116	·39742	·39894	·0908	·3305
D	·2743	·35371	·38421	·37475	·0813	·2231
N – C – D					·1721	·4464

(2)

	Coefficient of r^2.		Coefficient of r.		Absolute term.	
	Simple.	Weighted.	Simple.	Weighted.	Simple.	Weighted.
C	– ·0077	– ·0233	·02513	·07605	– ·01555	– ·04705
D	– *·00276*	– ·0124	·01924	·086	– ·01171	– ·0525
N – C – D	– ·0218	– ·049	·08824	·1977	– ·05427	– ·1216
Sums		– ·084		·3598		– ·2212

TABLE XII.

	Coefficient of r.		Absolute term.	
	Simple.	Weighted.	Simple.	Weighted.
B	*·01597*	·0815	– *·01091*	– ·0557
C – B	*·001*	·0075	– *·0041*	– ·0030
D	*·01924*	·0860	– *·01171*	– ·0525
N – C – D	*·08824*	·1977	– *·05427*	– ·1216
Sums ...		·3727		·2328

To begin with let us utilise only two of the compartments, say D and C. Then, if I have worked the arithmetic rightly,

$$E_C = \ldots {\cdot}02622 r^3 + {\cdot}000008 r^2 + {\cdot}15855 r - {\cdot}09808$$
$$E_D = \ldots {\cdot}01941 r^3 + {\cdot}00914 r^2 + {\cdot}14398 r - {\cdot}0813.$$

In order to employ the formula proper to the determination of a frequency-constant by way of percentiles, we require also an expression for the error incident to the remainder of the group exclusive of C and D. This error, which we may call E_{N-C-D}, is given at once from the consideration that for the group as a whole there is no excess or defect; $E_C + E_D + E_{N-C-D} = 0$. To find the *negative* of the last error we have only to add together the other two. Thus,

$$-E_{N-C-D} = \ldots {\cdot}04564 r^3 + {\cdot}00915 r^2 + {\cdot}3025 r - 1794.$$

Next it is proper to find the coefficients (of the powers of r, including the absolute term) in the expressions of the type $\frac{1}{2}\frac{d}{dr}E_t^2$ or $E_t\frac{dE_t}{dr}$. Thus for the residual compartment, as far as the second powers of r, we have—

$$(\cdot 1369r^2 + 2 \times \cdot 00915r + \cdot 3025)(\cdot 00915r^2 + \cdot 30253r - \cdot 1794).$$

Multiplying out I find $-\cdot 0218r^2 + \cdot 08824r - 05427$.

Similar calculations give us the coefficients (of r^2, r^1, r^0) pertaining to the compartments C and D, the unweighted coefficients as we may call them prior to the division of each by the U proper to each compartment. These further results are exhibited in the second part of Table XI. By addition of the weighted coefficients in this part of the table there finally results for the determination of r the quadratic equation $-\cdot 084r^2 + \cdot 3598r - \cdot 2212 = 0$. The (fractional) root of the equation is nearly ·75; a result which is certainly too large, being considerably in excess of the values of r determined by Professor Pearson for C and D separately, or indeed of all of six determinations given by him (for A, B . . . F) ranging from ·5213 to ·5939. The discrepancy is no doubt due to the fact that I have stopped at the second power of r in the expansion of $E\frac{dE}{dr}$.

To show how to deal with an *interior* compartment, let us now take account of another "corner" compartment, namely, B. The total frequency-group may now be considered as made up of the following compartments, B, C − B, D, N − C − D. For B, utilising the data given in the first part of Table XI, I find

$$E_B = \cdot 011656r^2 + \cdot 133685r - \cdot 08164$$

Also $$E_C = \cdot 000008r^2 + \cdot 15855r - \cdot 09808$$

Accordingly $$E_{C-B} = \cdot 01165r^2 + \cdot 02486r - \cdot 01644.$$

Forming the expression $E\frac{dE}{dr}$ for each of the compartments B and C − B, I find the following (unweighted) expressions respectively:—

$$\cdot 015968r - \cdot 010914$$
$$\cdot 00101r - \cdot 00041.$$

I have not this time taken the trouble of forming the coefficients of r^2; the rather as it happens that by taking in r^2, but not r^3, we are likely to obtain a *worse* value than if we stop at the first power of r; to judge by the experience obtained in working the preceding example. The last-written expressions are to be multiplied by the weight proper to each compartment, viz., 1/U; where $U_B = \cdot 196$, $U_{C-B} = \cdot 1345$. We thus obtain the constituents of the expression which is to be minimised; constituents which are to be combined with those which have been already found for compartments D and N − C − D; as thus—

Compartment.	Coefficient of r.	Absolute term.
B	·0815	− ·0557
C − B	·0074	− ·00305
D	·086	− ·0525
N − C − D	·1977	− ·1216
	·3726	·2328

Whence $r = \cdot 625$; a result which no doubt would have been improved, if the approximation had been carried sufficiently far.

The procedure which has been illustrated can evidently be extended to any number of rectangular compartments. For instance, C may be broken up into A and C—A (where A is the corner compartment containing fathers and sons both below 67·5 inches); and A may be broken up into B and A—B.

I now go on to the general case in which the κ and λ coefficients are not zero. At first sight the greater generality would seem to involve much additional labour. Before, in order to pass from the concrete observed abscissa h' to the ideal h (the ξ of our generating surface), it sufficed to equate h to h'/σ, or in other terms ξ to x/a. But now ξ is equateable to $a/(1 + \kappa_1\xi + \lambda_1\xi^2)$. It seems, therefore, that we have first to ascertain separately for the x-curve the constants a, κ_1 and λ_1, and then to solve a cubic equation in order to determine each value of ξ. The determination of the values for η appears at first sight to involve similar trouble. But it must be remembered that the relative position of percentiles is not disturbed by translation (of the simple kind which we are supposing).* If m represents the median point on the abscissa of the generating curve, and p_1, p_2 the position of any two percentiles, and M, P_1, P_2 are what m, p, p_2 respectively become when translated, then M is the Median, P_1 and P_2 define the same percentiles of the constructed curve as p_1 and p_2 of the generating curve. Thus we are as well entitled as before when dealing with a normal group to construct δ from the contents of the (four) compartments formed by any two co-ordinates, to determine the h and k pertaining to a corner compartment, to deduce H and K therefrom, and so to form the Pearsonian equation for r; to be combined with the similarly obtained equations for any other (fourfold rectangular) divisions.† The only difference between this correlation coefficient and that which was calculated for a normal group is that *this* coefficient does not purport to be equal to the product-moment of the given group divided by a constant, the square-root of the product of the two standard-deviations.

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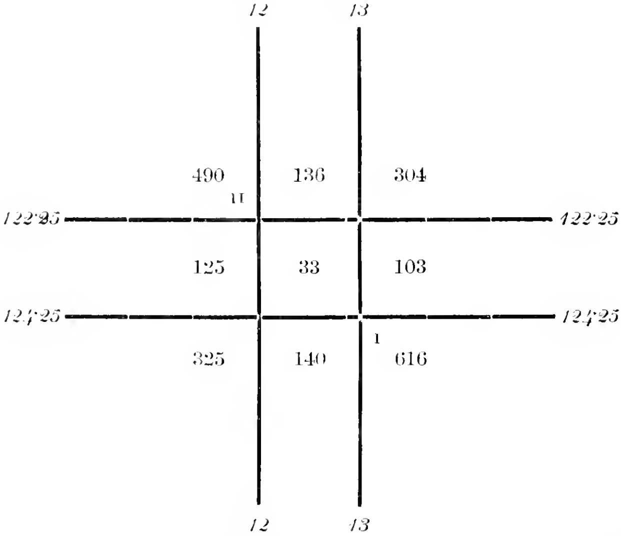
* Compare Yule, *J.R.S.S.*, vol. lxxv (1912), p. 613.

† Of course, if the values thus obtained for r are markedly discrepant, *cadit quæstio;* the data must be of an abnormal character for which I do not undertake to prescribe. But I should not be frightened by a discrepancy somewhat in excess of what I may call the regulation probable-error; namely, that which is calculated on the supposition that the number of observations the square root of which figures in the formulæ for probable error corresponds to an equal number of trials as independent, say, as the successive throws of a die at random. For in general, I think, for concrete material such ideal independence is not to be postulated; without specific verification, as is sometimes afforded, with respect, for instance, to alpha particles escaping from radio-active substances (*cp. J.R.S.S.*, vol. lxxvi (1913), p. 168), or with respect to the ratio between the sexes at birth (*cp. J.R.S.S.*, Jubilee volume, *Methods of Statistics*). With respect to social phenomena at least the fortuitousness of observations is apt to be clogged by all manner of correlations such as those which I have pointed out with respect to *Variation in the rate of births, deaths and marriages* (*J.R.S.S.*, December, 1885). The assumption of perfect *independence* in mathematical statistics is like the assumption of perfect *competition* in mathematical economics, useful but not exact.

As this method of determining the correlation coefficient of the generating surface, unlike that which was based on the product-moment, does not require the previous determination of the translation coefficients, this method seems specially appropriate to that variety of the problem of which the object is rather the correlation between the variates than the frequency of their concurrence. It may be well to remind the reader that the latter object is the one which I aim at primarily; and that it is limited to frequency-loci which have some affinity to the normal law.* Correlation in general, Association, and the various coefficients

Fig. 16.



Each vertical line divides *higher* ages on its *right* from lower ages on its left. Each horizontal line divides *greater* head-heights *below* the horizontal from smaller head-heights above the horizontal.

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* As I assume some affinity to the normal law I am not here concerned with Professor Pearson's interesting proposal to use his determination of r from cross-divisions, even when there is no such affinity, "solely as an artifice for "transferring to an adequate mental scale improbabilities often sensible only in "the 30th or 40th decimal place" (*Novel Method of regarding Association,* Biometric Series, viii, p. 4, 24, *et passim*), "merely as a scale to measure pro-"bability on" (*Tables for Statisticians*, p. xxxvii). But one of the arguments which Professor Pearson uses in defence of this proposal is relevant to our use of his doctrine of contingency; the ΣE^2 which we have repeatedly employed being an example of the Pearsonian χ^2. In our determination of the

which distinguished statisticians have adapted to those wider conceptions, lie beyond my scope.

FIG. 17.

784	407
465	616

Let us consider an example which has been already employed to illustrate the use of the product-moment,* Illustration B of Professor Pearson's "Fourteenth Contribution." The data which we propose to utilise are presented in Fig. 16. Let us take for a first corner compartment the class defined by age greater than 13 (inches), head-height greater than 122·25 (mills.). The corresponding fourfold table is shown in Fig. 17. From this we deduce

$$\delta_{\mathrm{I}} = (784 \times 616 - 407 \times 465)/2272^2 = \cdot 0569;$$
$$\mathrm{U}_{\mathrm{I}} = 616/2272 = \cdot 2711;$$

$\frac{1}{2}\alpha$, the area of the generating curve with unit standard deviation intercepted between the Median and the ordinate corresponding to the position of the vertical line in the fourfold table,

$$= (\tfrac{1}{2}2272 - (407 + 616))/2272.$$

Whence $\alpha = \cdot 1$ nearly; and accordingly, by Sheppard's Table II, $h = \cdot 12566$ nearly. By parity of reasoning k is found to be ·0607. H and K are thence found from the table to be ·3958 and ·3982 respectively. Using the Pearsonian formula, I thence find

$$\mathrm{E}_{\mathrm{I}} = \;.\;.\;.\; \cdot 00601 r^2 + \cdot 1576 r - \cdot 0569.$$

Similarly treating the compartment defined by age less than 12 (years), and head-height less than 122·25 (millimetres), the left hand upper corner in Fig. 16, I find

$$\mathrm{E}_2 = \cdot 00379 r^2 + \cdot 1514 r - \cdot 0463.$$

Combining these two errors, I have for (the negative of) the error of the rest of the group, the residual compartment

$$\mathrm{E}_{\mathrm{III}} = \cdot 0098 r^2 + \cdot 309 r - \cdot 1032.$$

constants—a, κ, λ, r—which make χ^2 a minimum, we may seem to have treated $\frac{1}{\sqrt{\pi}}e^{-\chi^2}$ as if it were perfectly analogous to the familiar $\frac{1}{\sqrt{\pi}}e^{-\tau^2}$, where τ is the ratio of an assigned deviation to the constant of dispersion; $\int_\tau^\infty \frac{1}{\sqrt{\pi}}e^{-\tau^2}d\tau$ (or it may be *twice* that integral) measures the improbability of the deviation occurring. But the important note appended to the *Novel Method of regarding Association* shows the imperfection of this analogy. It will be found however, I think that my use of $\Sigma\mathrm{E}^2$ does not come within the danger of that note. In one passage, indeed, I have inadvertently referred to the integral of $\frac{1}{\sqrt{\pi}}e^{-\chi^2}$ as the "measure" of improbability (*ante*, p. 730). I should have said "index"; much as one might loosely call $\frac{1}{\sqrt{\pi}}e^{-\tau^2}$ the index of the integral which measures probability of τ being exceeded (the smaller the index the smaller the measure).

* Above, p. 841.

We have then to form the expressions of the type $\frac{1}{2}\frac{d}{dr}E^2$ and divide each by the proper U ($U_I = \cdot 2711$, $U_{II} = \cdot 2157$, $U_{III} = \cdot 5132$). Proceeding as in the case of the normal group, I find ultimately $\cdot 3762r - \cdot 1279 = \cdot 0$; an equation which gives a higher value of r than that which I obtained before by utilising the product-moment. The discrepancy is no doubt to be explained by my having stopped short at the first power of r. Possibly some inaccuracy in the arithmetic may have aggravated the incompleteness of the algebra. I trust that some more painstaking statistician will complete this and other calculations here left unfinished.

SOME FACTORS ASSOCIATED WITH THE ILLEGITIMATE BIRTH-RATE.

By J. W. NIXON, B.Sc.

THE subject of illegitimacy has been to a large extent neglected by social students. Partly, no doubt, because it cannot be discussed with the freedom attaching to other branches of vital statistics, the literature on the subject is very meagre. The single book on the subject appears to be a short one by Dr. Leffingwell, written nearly twenty-five years ago, while it is necessary to go back nearly sixty years before a contribution on the subject can be found in the Society's *Journal*, when Dr. Acton read a paper on illegitimacy in certain London parishes.

The statistics of illegitimacy raise many points of social importance and, in addition, readily lend themselves to scientific treatment. The following notes confine themselves almost entirely to the year 1911. This is the latest year for which statistics are available, and is, moreover, especially suitable as it coincides with the Census year. In addition, the vital statistics in 1911 are given for the first time for administrative, as distinct from registration, areas, and they can be brought into relation with the Census figures for individual areas with much greater accuracy than hitherto.

Illegitimacy has usually been measured as a proportion either to total births or to total population. The first method is unsuitable, in that it measures one variable in terms of another, and the second in that it does not allow for the varying age, sex and conjugal constitution of the population. A much more satisfactory, though not perfect, method[1] is to measure the number of illegitimate births in proportion to the number of unmarried women between 15 and 45 (*i.e.*, of fertile ages), and throughout this Paper illegitimacy is always measured in this sense.

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[1] The best measure would be a "standardised illegitimacy rate" taking into account the variations in the illegitimacy rate with age and the age constitution of the particular population. To obtain this "standardised rate," it would be necessary to know the ages of the mothers of illegitimate children—data which are not available for England and Wales. The vital statistics of Australia, however, give this information, and it is thought that the following analysis, based on the

The three methods of calculating illegitimacy give very different results, as the following table shows, where the rate in England and Wales during the last generation is given calculated by each method :—

Rates of illegitimacy, England and Wales.

	In proportion to total births.		In proportion to unmarried and widowed women 15–45.		In proportion to total population.	
	Rate per 1,000.	1876-80 = 100.	Rate per 1,000.	1876-80 = 100.	Rate per 1,000.	1876-80 = 100.
1876–80	47 ·5	100	14 ·4	100	1 ·7	100
'81–85	48 ·0	101 ·1	13 ·5	93 ·8	1 ·6	94 ·1
'86–90	46 ·3	97 ·5	11 ·8	81 ·9	1 ·5	88 ·2
'91–95	42 ·4	89 ·3	10 ·1	70 ·1	1 ·3	76 ·5
'96–1900	41 ·0	86 ·3	9 ·2	63 ·9	1 ·2	70 ·6
1901–05	39 ·5	83 ·2	8 ·4	58 ·3	1 ·1	64 ·7
'06–10	40 ·2	84 ·6	8 ·1	56 ·3	1 ·1	64 ·7
'11	42 ·7	89 ·9	8 ·0	55 ·6	1 ·0	58 ·8

figures for the years 1910, 1911, 1912, is of sufficient interest to be included here. The illegitimacy rate is calculated on the average number of illegitimate births in 1910, 1911, 1912 and the number of unmarried women from the Census of 1911.

Australian experience, 1910-11-12.

	Illegitimate births.			Illegitimate births + births in first six months of marriage.		
Age of mother. (1)	Number. (2)	Rate per 1,000 unmarried women between 15 and 45 (per annum). (3)	Rate per 1,000 total births. (4)	Number. (5)	Rate per 1,000 unmarried women between 15 and 45 + half women married in 1911. (6)	Rate per 1,000 total births. (7)
14	53	0 ·42	841	62	0 ·49	984
15..........	218	1 ·68	765	264	2 ·03	926
16	565	4 ·34	563	854	6 ·53	851
17..........	1,067	8 ·15	415	1,861	14 ·06	724
18..........	1,711	13 ·30	315	3,328	25 ·40	612
19..........	2,056	17 ·18	230	4,314	34 ·96	482
20..........	1,999	17 ·45	172	4,208	35 ·52	361
21–24	6,083	17 ·72	80	13,122	35 ·84	174
25–29	3,708	15 ·83	35	6,741	27 ·04	64
30–34	1,719	12 ·85	22	2,467	17 ·39	31
35–39	1,057	11 ·74	21	1,325	14 ·26	26
40–44	392	6 ·13	19	461	7 ·13	22
45–49	63	1 ·41	29	69	1 ·52	32
Total....	20,691	11 ·61	57	39,076	21 ·13	107

We thus see that illegitimacy is at a maximum during the years 21-24 and remains appreciably high until about 40. The rate, it will be noticed, is almost as high at 30-34 as it is at 18.

The Australian figures, however, go further still, and throw light on what Professors Geddes and Thomson call "the persistent and deliberate ante-

However calculated, the various methods all confirm one conclusion—that illegitimacy has continuously fallen since 1876; but whereas in proportion to total births it only fell by 10·1 per cent., in proportion to total population it fell by 41·2 per cent., and by the more exact method of proportion to unmarried women of fertile ages it fell 44·4 per cent. Most of the fall occurred before 1900, and during the last decade the decrease has been slower, especially since 1905.

It is interesting to compare the fall in the illegitimate rate with that of the general birth-rate, and the next table gives corresponding figures for all births in proportion to total population, and for legitimate births in proportion to married women. The illegitimate rate, it will be noticed, has fallen more than the legitimate rate—the latter having fallen 33·8 per cent. compared with 44·4 per cent. for illegitimate births.

England and Wales. Birth-rate and legitimate fertility.

Years.	Birth-rate calculated on total population.		Legitimate fertility calculated on married women 15–45.	
	Rate per 1,000.	1876-80 = 100.	Rate per 1,000.	1876-80 = 100.
1876–80	35·3	100	296·3	100
'81–85	33·5	94·9	282·4	95·3
'86–90	31·4	89·0	267·1	90·1
'91–95	30·5	86·4	258·3	87·2
'96–1900	29·3	83·0	242·9	82·0
1901–05	28·2	79·9	230·5	77·8
'06–10 ...	26·3	74·5	212·9	71·9
'11....	24·4	69·1	196·2	66·2

"nuptial experimenting in the fertility of a proposed marriage," which they inform us still "lingers in northern countries." (*Sex*, 1914, p. 104.) It is obvious that statistics of illegitimacy are vitiated by the extent to which marriage takes place after conception; and some countries, it is believed, classify as illegitimate all births occurring in the first six months of marriage. No figures on this side of the subject exist in England, but Australia again leads the way and gives the number of births during each of the first twelve months of marriage according to age of mother. Taking births within the first six months of marriage as being conceived out of wedlock, we get the figures shown in column 5 of the above table. The number is almost doubled, showing that in the three years 1910-12 almost as many were born in the first six months of marriage as before marriage. In column 6 a rate is calculated to compare with the rate in column 3. In forming this rate the denominator cannot consist only of the unmarried women (15–45), but what is wanted in addition is the age-distribution of all wives of less than six months' standing at the date of the Census. This is not available, nor can we distribute the number of marriages in the six months preceding the Census of 1911 according to the age-distribution of all marriages in 1911. The difficulty was got over by taking half the number married, at each age, in 1911. This number, added to the number of unmarried women, forms the denominator of the fraction of which the number of illegitimate births + the number of "six-months births" forms the numerator. The rate is doubled from ages 18 to 24, and for all ages almost doubled: from 11·6 to 21·1. Another column is added, giving the number in proportion to total births. Australian illegitimacy is, as will be seen by comparing the above figures with tables in the text, much higher than English.

In contrast to the illegitimate, the legitimate rate has fallen at an increasing rate since 1900. Whereas the former fell 36·1 per cent. to 1896-1900 and 8·3 per cent. further to 1911, the latter fell 18 per cent. to 1896-1900 and 15·8 per cent. more to 1911.

The number of illegitimate births varies so very little from year to year that it is possible to predict with considerable accuracy the number which will occur in any year. The following table shows the number of illegitimate births in England and Wales during the last twelve years, from which it will be seen that it fluctuates very closely around 37,000:—

Number of illegitimate births, England and Wales.

Year.	Number.	Year.	Number.	Year.	Number.
1901	36,199	1905	37,315	1909	37,509
'02	36,674	'06	37,390	'10	36,635
'03	37,302	'07	36,189	'11	37,633
'04	37,674	'08	37,531		

No comparisons have been made in this Paper with Continental statistics of illegitimacy. The legitimacy laws, methods of registration and the definition of an illegitimate birth differ so considerably from country to country that comparisons are useless. In our own country the statistics of illegitimacy are, no doubt, affected by the subsequent marriage of the parents, by concealment, infanticide, &c., and absolute accuracy in recording such events cannot be hoped for; but the persistence of the phenomenon year after year seems to show that the figures are fairly reliable, and that some factors are at work producing annually about 37,000 illegitimate births. Scotland and Ireland similarly show an amount of illegitimacy varying very little from year to year, yet the differences between their rates and the English are enormous. Year after year the Scottish rate is nearly twice the English, and the English nearly twice the Irish, the following being the rates for 1911 per 1,000 unmarried and widowed women 15–45:—

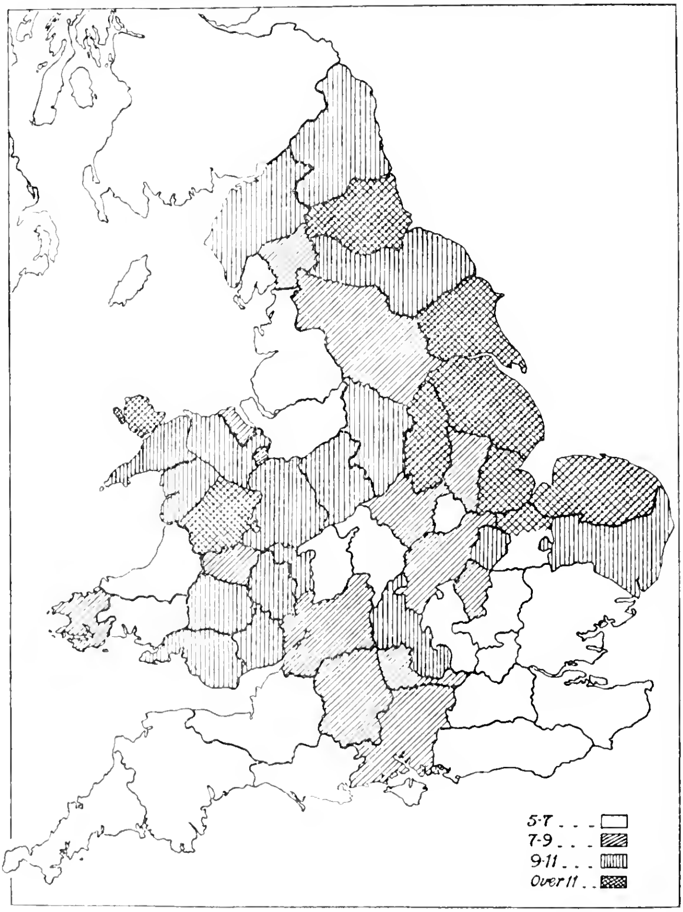
England and Wales .... 7·98 Scotland .... 14·00 Ireland .... 4·36

The Irish figure is particularly interesting, as the proportion of men and women unmarried in that country is extremely high.

Such differences, persisting year after year, ought, one would think, to be easily explicable; but if we analyse the figures we find that the rates vary as much between different parts of England or different parts of Scotland as they do between England and Scotland as a whole. The illegitimacy rate in 1911 varied among the English countries from 14·9 in Norfolk and 17·1 in Anglesey to 3·5 in Isle of Wight and 5·1 in Somerset. Similarly, among County Boroughs, the rate ranged from 15·9 in Grimsby and 14·3 in Rotherham to 4·6 in Bath and 3·8 in Bournemouth. Year after year the same districts are to be found with a high rate and the same with a low rate. The counties of high rates are Hereford, Salop, Staffs, Notts, Cumberland, and of low rates Cornwall, Devon, Dorset, Lancashire, Leicester. An absolutely thorough investigation would, no doubt, require to discuss the question of race and local custom in this respect; here we merely record the fact. The distribution of illegitimacy over the administrative counties of England and Wales in 1911 can be studied from the map below:—

Illegitimacy rates per 1,000 *unmarried and widowed women aged* 15–45, 1911.

Administrative Counties of England and Wales.



We see at once that all counties south of the Thames and Severn are counties of low illegitimacy, while the northern counties and Wales generally show high rates. Excessive rates are usually found in the rural areas of mining districts. The distribution among county boroughs and rural and urban districts separately cannot be conveniently shown on a map, but the following table (containing the only rates given in the Registrar-General's Annual Report) shows how illegitimacy is distributed among different classes of areas grouped in four geographical divisions.

The table confirms for these areas what was stated above for administrative counties, viz., the high rate in the north and in Wales. The rural districts in all divisions show higher rates than the urban, while the county boroughs usually have rates intermediate between them.

Illegitimacy in England and Wales, 1911. Rates per 1,000, unmarried and widowed women 15–45.

(*Report, Registrar-General*, 1911, p. xxvi.)

	North.	Midland.	South.	Wales.	England and Wales.
London	—	—	6·47	—	—
County boroughs	8·54	8·09	7·14	8·51	8·23
Other urban districts	8·21	7·62	6·47	9·12	7·68
Rural districts	9·66	9·97	7·44	10·56	9·26
All areas	8·56	8·37	6·72	9·51	7·98

Such variations may be accounted for by differences in poverty, housing accommodation, education, urban life, religion, race, &c. That race may be a potent factor was urged by the Registrar-General in 1855. Writing in the 14th Report, Sir George Graham says: "Excluding London, generally the unmarried women in "counties south of the Thames, comprising the descendants of the "old Saxon population, have few illegitimate children; the west "Midlands, the north-west and south Midland counties, covering "the area of ancient Mercia, present less favourable results; while "in Yorkshire, the northern counties, and the north Midland counties, "covering the area of the ancient Danish population, the number "of illegitimate children is excessively great." Illegitimacy is still high in the north and low in the south as it was sixty years ago; but apart from the effects of intermarriage and movements of population, which must have largely counteracted any difference in morals due to difference of race, many other factors may be suggested which may produce such variations. If we appeal to religious influences, we cannot reconcile the very low rate of Catholic Ireland with the very high rate of Calvinist Scotland. Again, if we consider wealth, thrift and prosperity, which are, one would think, secure safeguards against moral laxity, we find a high rate in Scotland, the land of thrift, and a low rate in Ireland, the land of poverty. Town life, say the moralists, contains more inducements to immorality than rural life, but in all parts of the country illegitimacy is higher in rural than in urban area (*cf.* table, above), while London possesses an exceptionally low rate.

Statistics of illegitimacy are subject to an important qualification —the extent to which they are modified by the prevalence of methods for preventing conception. It is only to be expected that these methods should be more widely known and practised in towns than in villages, and, in addition, it is more likely that illegitimate births escape registration in towns than in country. These considerations explain to some extent the higher rate in rural districts.

One difficulty in estimating the influence of poverty, education, religion, &c., is that we cannot measure them satisfactorily. There are other likely factors, however, which can be measured readily by using the published statistics given in the Census volumes—such as housing accommodation, the number of domestic servants, the number of women in employment, or the number of unmarried men to unmarried women. These are now considered in detail.

Illegitimacy and Domestic Servants.—Domestic servants as a class are generally held to be peculiarly "exposed to risk," and it is true that domestic servants are the mothers of nearly half the illegitimate children. The Registrar-General classifies by occupation the 37,633 mothers who gave birth to illegitimate children in 1911, and of these 17,057, or 45 per cent., were indoor domestics, or if we include all domestic service (laundry, charwomen, &c.) we get 55 per cent. The Census of 1911 gives the proportion of unmarried women (15–45) who were indoor domestics as 32 per cent., or 35·3 per cent. for all domestic offices. But if we correlate the number of domestic servants per 1,000 private families (obtained from Vols. VIII and X of the Census) with the illegitimacy rate we get :—

County boroughs (75) .... $r = -0·29 \pm 0·07$
Metropolitan boroughs (29) .... $r = -0·43 \pm 0·102$

Both these are negative and fairly significant. It is submitted, however, that very little can be inferred from these or from any similar correlations for domestic servants and illegitimacy. Domestic service consists of a very heterogeneous class, as is obvious if we compare the servants of a wealthy district with those of a poor one. Not only the class, but the age-distribution varies from district to district. The difference in the number of servants per family in Hampstead or Kensington and Bethnal Green or Bermondsey is increased if we exclude the young servants in each case. But exact figures for this are not available. A high illegitimacy due to the prevalence of domestic servants might be masked by the low illegitimacy of the remaining unmarried women who are the more numerous where there are more domestic servants. The number of domestic servants is not a very satisfactory index either of social status or general prosperity—a possibly more satisfactory one can be obtained from housing statistics.

Illegitimacy and Housing.—The moral effects of bad housing have been too often dwelt upon by social reformers to need restating. Kingsley's well-known lines are re-echoed in the recent report of the Land Inquiry Committee.[2] Taking as a measure of housing accommodation the number of people overcrowded according to the Census definition of more than 2 persons per room, we find the following correlation between the illegitimacy rate and percentage overcrowded :—

Administrative counties[3] (61)	$r = + \cdot 501 \pm \cdot 064$
County boroughs (75)	$r = + \cdot 215 \pm \cdot 073$
Metropolitan boroughs (29)	$r = + \cdot 130 \pm \cdot 102$
Rural districts of Norfolk and Suffolk (36) . . .	$r = + \cdot 112 \pm \cdot 110$
Rural districts of North Wales (30)	$r = - \cdot 002 \pm \cdot 120$

Here the coefficients are all positive and significant with the exception of the last two. How far is this due to the indiscriminate mixing of the sexes which overcrowding involves ? The large towns may be influenced by the circumstances mentioned above, such as prostitution and prevention of conception. It is noticeable that in almost all ports overcrowding and illegitimacy are negatively associated. Devonport, Plymouth, West Hartlepool and Tynemouth have a high percentage overcrowded and low illegitimacy, and Grimsby, Yarmouth, Swansea, Portsmouth and Newport have low overcrowding with high illegitimacy. Two parts of the country were separately examined as being homogeneous areas, almost free from disturbing conditions, viz., the rural districts of North Wales and those of Norfolk and Suffolk—both being comparatively free from urban influences. In both cases correlations of no significance were obtained. Although these two correlations do not certainly disprove that illegitimacy is associated with overcrowded housing conditions, they indicate the necessity for statistical analysis of their figures on the part of those who do claim such a positive association.

Other factors which suggest themselves to correlate with illegitimacy are (1) the number of unmarried women (15–45) engaged in occupations : (2) the number of unmarried men for fixed number of unmarried women of fertile ages, and for the four classes of areas the following coefficients were worked out. In order to avoid possible fallacies in the use of rates, actual numbers were employed in this and partial correlation coefficients determined. Thus the partial correlation between number of illegitimate births and number of unmarried men for constant number of unmarried women is analogous to determining the correlation between illegitimacy rate and proportion of unmarried men to unmarried women, but avoids possible fallacy involved in correlating x/y with z/y.

The results are shown in the following table, where the subscripts denote : (1) Number of unmarried women over 15 ; (2) number of unmarried occupied women over 15; (3) number of illegitimate births; (4) number of unmarried men over 15:—

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[2] See vol. 1, "Rural," part 1, chap. ii, sect. 3.

[3] Not including London.

Summary of correlation coefficients.

	Rural districts (61).	Urban districts (61).	Administrative counties.		County boroughs.	
			All (except London) (61).	Omitting 4 mining counties.	All (75).	Omitting 7 residential (68).
r_{12} ...	+·8117	+·9619	+·9918	+·9965	+·9863	+·9646
r_{23} ...	+·6305	+·9129	+·8864	+·9369	+·8894	+·8902
r_{13} ...	+·7620	+·9568	+·9305	+·9471	+·9388	+·9243
r_{34} ...	+·8172	+·9617	+·9597	+·9671	+·8916	+·9665
r_{14} ...	+·8966	+·9590	+·9540	+·9567	+·9662	+·9530
${}_1r_{23}$ ...	−·0314 ± ·077	−·1345 ± ·081	−·0564 ± ·060	−·2371 ± ·084	−·2178 ± ·071	+·1687 ± ·078
${}_1r_{4}$ ...	+·4671 ± ·069	+·5362 ± ·061	+·6701 ± ·049	+·6511 ± ·051	+·3905 ± ·066	+·5125 ± ·048

As no rates were used, the first order coefficients must naturally be large and positive, and it is the partial coefficients that are of importance. Among these we see some interesting results. The two important values are r_{23}—the relation between illegitimate births and occupied women for constant number of unmarried women, *i.e.*, shortly, illegitimacy rate and employment of women; and ${}_1r_{43}$—the relation between illegitimate births and unmarried men for constant number of unmarried women, *i.e.*, shortly, illegitimacy rate and proportion of single men to single women.

These coefficients with their probable errors are given for the four classes of administrative areas in the above table. In addition it was decided to calculate the coefficients for a more homogeneous group of counties by omitting 4 showing special conditions, viz., the mining counties of Glamorgan, Monmouth, Northumberland and Durham—all of which have a low proportion of women occupied and a large excess of unmarried men. Similarly for the county boroughs, 7 were anomalous in that they were residential and contained a large excess of unmarried women, viz., Bath, Bournemouth, Brighton, Canterbury, Eastbourne, Hastings and Oxford, and the coefficients were re-evaluated for the remaining 68.

The first conclusion is that the employment of unmarried women is not correlated with illegitimacy. In every case the coefficient is small and (with one exception) negative. Considering their probable errors they are of little significance. It is often urged that factory life exposes women to temptations they would not otherwise meet. Whether or not this be true, it is not supported by the figures of illegitimate births. Lancashire with the highest proportion of occupied women has almost the lowest illegitimacy, but Sussex with a low proportion of women occupied has also a low illegitimacy. The values of the above coefficients depend upon whether or not the various regressions are linear. To examine this, the mean illegitimacy rate in each group of districts arranged according to the percentage of women occupied was ascertained.

Without using any refined tests, the means in the case of the counties appeared to be on a line showing small negative correlation; but in the case of the 75 county boroughs, the mean illegitimacy from the group with the lowest percentage of women occupied (50–55 per cent.) was much higher than for any of the other groups which differed but little among themselves. This group consisted of St. Helens, Middlesbrough, Rotherham, Merthyr and Tynemouth.

It is probable that methods of prevention of conception are more widely known and practised among the occupied women than among the stay-at-homes, by reason of their mixing more with their own and the opposite sex, and any relation between illegitimacy and occupation might be affected by this consideration.

When we come to the association between the relative number of unmarried men to unmarried women and illegitimacy we see very different results. We get a series all positive and significant. We can say with some confidence that, whether in large towns, small towns, or country districts, the more unmarried men the higher will be the illegitimacy rate. The effect of excluding the mining districts where unmarried men are in excess of unmarried women is to leave the coefficient practically unchanged, while the exclusion of the residential areas slightly increases the coefficient.

The value of ${}_1r_{43}$, the association between illegitimacy and relative surplus of unmarried men, might perhaps be affected by considerations of social status. Districts of high social status have many unmarried women as domestic servants, and consequently *relatively* few men, and on the whole low illegitimacy rates. We should, therefore, correct further for constant social status. A very rough measure of this is indicated by the proportion of unmarried occupied women, which we have denoted by suffix (2). Thus ${}_{12}r_{43}$ gives a rough idea of the association between illegitimacy and excess of men for constant social status. Without working this out, it can readily be seen from the crude correlations in the above table that this will differ but little from ${}_1r_{43}$. Hence, so far as our rough measure permits us to draw inferences, the association noted between excess of unmarried men and illegitimacy is not produced directly by variations in social status. Obviously, however, the proportion of unmarried occupied women is not a very good measure of social status.

This note has not pretended to discuss the effect of all possible factors affecting the illegitimate birth-rate. A number of other factors will readily suggest themselves to readers acquainted with the Registrar-General's statistical volumes, *e.g.*, the marriage-rate, fertility, and the age at marriage. Such factors as prosperity, a good or bad harvest, or prostitution might be considered. In particular, the extent to which early marriage is customary in a district might be expected to affect illegitimacy. The age at marriage is published only for England and Wales and for London, and an indirect method of dealing with the point, viz., taking the proportion of married women to total women in age groups 15–19, &c., is vitiated by the impossibility of separating the figures for domestic servants from those of the other population. It is not possible from the published figures to form such a proportion with domestic service omitted. Greater detail in the published figures may ultimately lead to more knowledge of the subject of illegitimacy, but it is one affected by so many correlated circumstances that only by the use of technical methods can we hope to determine the part played by each one.

I wish to thank Dr. Snow for the large amount of help and advice he has given me in the writing of this Paper.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Work and Wealth: A Human Valuation.* By J. A. Hobson. ix + 367 pp., 8vo. London: Macmillan, 1914. Price 8*s.* 6*d.* net.

Mr. Hobson has in this, as in previous productions of his active pen, devoted meticulous pains to the elaboration and support of a position which can, we think, be described as intermediate. It lies between that taken by the extreme "left-wing" of contemporary socialists, and that adopted by the open-minded section of economists, which, breaking away from the "orthodox" *laissez-faire* prevailing in the past, is still not prepared for so extensive a reconstruction of theory and of practice as that advocated in the volume now before us. For this reason his book will probably be regarded by many readers as suggestive and stimulating, even if they do not consider it satisfactory or convincing. They will recognise the independence of view at which the author aims, if a convenient vagueness seems still to cling, in his handling, to that standard of "organic welfare" to the observance of which he notes that other reformers besides himself turn inevitably, if unconsciously, their thoughts and acts. "From each according "to his power, to each according to his needs" is indeed a dictum which has a familiar ring. Interpreted in the fresh light that Mr. Hobson tries to throw by his theory of "unearned surpluses," accruing under existing economic arrangements to favoured classes and individuals, in excess of the just, or even of the socially expedient, reward of "costs" incurred that would be requisite to insure an efficiency not merely adequate but progressive, the maxim might be held to demand the intellectual subtilty of an omniscient just archangel for its smooth equitable adaptation to the workaday world in which we live. A gap at least appears to yawn between this refined conception, the origin of which is evident in later developments of an economic theorising that Mr. Hobson censures from another standpoint, and the taxation of the saving rich for the benefit of the spending poor by the rough hands of crude interested politicians. Here, as elsewhere, our author recommends such a programme of practical reform, which in fact will prove, we believe, to be more specious than substantial, or is at any rate less indubitably equitable in distribution than it is hazardous to production. But his scheme, we must admit, is the child of prolonged reasoning and not of the blind prejudice or feverish emotion which characterise many socialists.

And, similarly, as respects the economists from whom he disagrees, his detachment is as manifestly the result of anxious laboured meditation as are the logical influences that deter him from joining company, for instance, with syndicalistic propaganda. Some of his censure may not be deserved; but it would at least be difficult to withhold assent from his apposite remark that in the stress laid by writers of the present day on what are called "marginal" forces they return, in effect, to something like that assertion of an economic harmony with which their predecessors were once disastrously content. Nor could the impartial bystander, whether he were the more dissatisfied with the economists or with the socialists, deny the sinister pertinence of much of Mr. Hobson's shrewd suggestive indication of defects crying for reform, both on the ground of excessive harmful costs incurred in the present production, and of glaring noxious mal-adjustment in the existing distribution, of wealth. That the systems of economists have been biased by too much reference to the requirements of production, if socialists have fixed their gaze too exclusively on distribution, may also be allowed, together with a due recognition of the tardy notice lately given by the former to consumption. In short, while Mr. Hobson's essay is by no means easy reading or perspicuous argument, it rarely fails to stir or to provoke to close and profitable reflection; and he himself has comprehended within the range of that study, of which he presents the results, a great mass of diversified and interesting material as, for instance, on "scientific" management. In this book he has, too, brought conveniently together much of what he has before expounded in separate publications, and in the process he seems to us to have, in some cases at least, modified with advantage an exaggerated emphasis. L.L.P.

2.—*Science and Method.* By Henri Poincaré. Translated by Francis Maitland. With a Preface by the Hon. Bertrand Russell, F.R.S. 288 pp., 8vo. London: Thomas Nelson and Sons, 1914. Price 6*s*. net.

Henri Poincaré was, by general consent, the most eminent scientific man of his generation. With a mind of extraordinary comprehensiveness and lucidity, he excelled as philosopher, mathematician, astronomer and physicist. As a philosopher he is widely known through his authorship of *Science and Hypothése.* The work under notice is a translation of a more recent collection of "various studies which are more or less directly concerned with "scientific methodology."

The statistician, *qua* statistician, will not be so interested in the portions relating to "The New Mechanics" and "Astronomical Science," as in those on "The Scientist and Science" and "Mathematical Reasoning," an appreciable portion of which is devoted to a criticism of the writings of the mathematical logisticians. The chapter making the most direct appeal to the statistician is that on "Chance." In some respects we find this a little disappointing, and it is perhaps a matter for regret that Poincaré's activities did not lead him to the mathematical problems associated with the modern statistical theory of multiple correlation. No discussion of the complicated issues bound up with the question of cause and effect (adverted to in that chapter) can now be considered complete which does not recognise the use of the new calculus specially designed to measure the separate effect of each individual cause. A number of highly important problems still await solution, and Poincaré's remarkable mathematical acumen could, no doubt, have made valuable advances in the theory.

There can, however, be no doubt as to the need of a "scientific "methodology" to the statistician. The notion that the latter is merely a compiler and arranger of figures, and as such requires no more training than a ledger clerk, is dying very slowly and will linger long. But the tools are now available for the solution—through statistics—of problems in various departments of science which otherwise cannot be adequately investigated. Those engaged in medical research were the first to recognise the new field open, and the meteorologist is following. But it is essential to recognise that the new calculus is, if not a science in itself, at least a branch of scientific method, and can no more be properly used without initiation than can, say, the methods of the integral calculus.

The book does not lend itself to detailed review suitable for the present *Journal.* Its most attractive feature is one which is present in all Poincaré's works, viz., the wealth of apt simile and fertile analogy. One illustration of this, of special appeal to the biometrician, must suffice.

Referring to the postulate that "phenomena obey the laws of "chance when small differences in the causes are sufficient to produce "great differences in the effects": "The greatest chance is the birth "of a great man. It is only by chance that the meeting occurs of two "genital cells of different sex that contain precisely, each on its side, "the mysterious elements whose mutual reaction is destined to "produce genius. It will be readily admitted that these elements "must be rare, and that their meeting is still rarer. How little it "would have taken to make the spermatozoid which carried them "deviate from its course. It would have been enough to deflect "it a hundredth part of an inch, and Napoleon would not have been "born and the destinies of a continent would have been changed. "No example can give a better comprehension of the true character "of chance." E.C.S.

3.—*Le Hasard.* Par Émile Borel. iv + 312 pp., 8vo. Second Edition. Paris: Librairie Félix Alcan, 1914. Price 3 frs. 50 c.

The demand for semi-popular articles and books on the theory of probability would seem to be considerable, and several eminent French mathematicians have endeavoured to satisfy it. Among these M. Borel is not the least distinguished. The work before us is a clear exposition of fundamental ideas, and is divided into three parts. The first deals with some of the simpler problems of chance, including a short study of that vexed question, the probability of causes. In the second, the applications of the theory of probability to sociological, biological, physical and purely mathematical problems are examined; and in the last the value of the methods of probability from the practical, the purely scientific, and the philosophical aspects is discussed.

Naturally one does not expect to find in a work of this kind any mathematical novelties, and, so far as the purely mathematical aspect is concerned, the book hardly contains anything which had not already been well said in M. Borel's *Éléments de la Théorie des Probabilités.* The discussion of the practical value of the laws of chance is, however, a sufficient apology for a new work, being admirably sane and likely to dissipate various popular misconceptions.

The section dealing with the interpretation of majorities, the argument being well illustrated by the analysis of some data collected by Mme. Rousson, is also of value. M. Borel's discussion of statistical biology is confessedly incomplete, and may not appear altogether satisfactory to the English reader. We doubt whether effective agreement with the Gauss-Laplace type of distribution can be regarded as an adequate criterion of racial purity, while the reference to the theory of correlation is too slight to convey a distinct idea to the general reader.

It is unnecessary to inform those familiar with M. Borel's writings that his argument is frequently enlivened by a ray of quiet humour or good-natured sarcasm. Thus, after quoting Bertrand's trenchant criticism of Condorcet and others' work on the probability of judgments, M. Borel meekly observes. "It would be interesting to "inquire whether Condorcet, Laplace, Poisson, Cournot were really "as ingenuous as Bertrand seems to think they were." His definition of Baccarat will also bear quoting: "A rudimentary game, the "mathematical theory of which can be completely worked out; "for that reason, a game entirely devoid of any interest of its own, "and merely a rapid way of either losing or gaining money."

It speaks well for the intellectual curiosity of the French-reading public that this work has reached a second edition.

M.G.

4.—*Le Jeu, la Chance et le Hasard.* By Louis Bachelier. 320 pp., 8vo. Paris: Flammarion, 1914. Price 3 fr. 50 c.

This is one of the volumes of the Bibliothèque de Philosophie Scientifique in which appeared, for example, Henri Poincaré's works on *Science and Hypothesis* and *Science and Method.* It is presumably intended to appeal to the general reader rather than the specialist, and the treatment, necessarily elementary, is, when it comes to definite mathematical results as distinct from philosophical discussion, often dogmatic rather than explanatory. The ground covered is extremely wide, notwithstanding the fact that the study of statistics lies outside the author's programme, as well as the applications of statistical methods to biometry. Chance, probability, mathematical and moral expectation, means, the origins of the theory of probability, lotteries, the laws of large numbers, Bernoulli's law, the ruin of gamblers, the illusions of gamblers, new theorems in probabilities, speculation, the probability of future events in the light of past experience, errors of observation, the principle of the mean, frequency curves, target shooting, is a very varied and extensive field to survey in the space available. In the chapter on target shooting (p. 300) a rather serious slip seems to have occurred. The reader is told to mark on the horizontal through the centre of the target the points corresponding to the horizontal probable error (écart probable); and similarly on the vertical axis the points corresponding to the vertical probable error. It is then said to be an equal chance for a bullet to hit the target inside or outside the ellipse through these points. If we have not seriously misunderstood the author's instructions, only some 20 per cent. of the bullets will fall within the ellipse so drawn; the "probable ellipse" has semi-axes equal to 1·177 times the standard-deviation, or nearly 1·75 times the probable error.

The best portion of the book, we think, is that dealing with the law of large numbers and Bernoulli's law, while the most novel features lie in the chapters or paragraphs based on the author's large volumes *Calcul des Probabilités* and *Théorie de la Speculation.* The two chapters on the latter subject give, perhaps, just enough to make a reader desirous of forming an acquaintance with the larger work, but we doubt if the same can be said of the author's occasional passages on "rayonnement" and some other subjects which, as they stand, are simply obscure, in places mystical. What else can one term a little poem like the following headed so coldly, "§ 1.—Rayonnement des probabilités," which opens Chap. XVI in all the baldness of ordinary type? Let it be honoured by italics at least:—

§ 1.—RAYONNEMENT DES PROBABILITÉS.

La probabilité qui est une abstraction rayonne comme un petit soleil.
La probabilité qui est une abstraction se désagrège comme le morceau de sucre que nous mettons dans un grog.
La probabilité nait d'une source instantanée; elle jaillit spontanément, avec une rapidité infinie, puis elle se diffuse lentement dans l'espace.
La probabilité est une sorte de fluide formant des ondes qui se propagent et qui s'éteignent comme les houles de l'Océan.
La probabilité n'est pas seulement le rapport de deux nombres dont le premier est toujours plus petit que le second; c'est une sorte de matière, d'énergie, . . . de chose qui se transforme et qui est, pour ainsi dire, animée et mouvante.

Now *I* never thought of probability like that. G.U.Y.

5.—*Gewerbestatistik.* Von Professor Dr. A. Hesse. Zweite, völlig umgearbeitete Auflage. (Grundriss zum Studium der politischen Oekonomie von Prof. Dr. J. Conrad. Vierter Teil: Statistik. II. Teil: Die Statistik der wirtschaftlichen Kultur. II. Hälfte.) xiii+470 pp., 8vo. Jena: Gustav Fischer, 1914. Price 13 Marks.

The first edition of this work was published in 1909 and reviewed in the *Journal* in September of that year. The lapse of time has enabled the author to incorporate in the body of the book the results of the German industrial census of 1907, and has furnished him with later, and in some cases fuller, statistics of industry in other countries. For instance, a notable gap in the information available for the earlier edition has been filled by the publication of the results of the British Census of Production relating to the year 1907. In other respects, also, the work has been completely revised. Less stress is laid in the present edition on the reproduction of statistical material, and more space is devoted to a consideration of the methods and technique of industrial statistics and the light such statistics throw on economic conditions. The author's comments on the published statistics, although on lines more or less familiar to students of the subject, form a useful corrective to any tendency on the reader's part to hasty generalisation from the statistics or misplaced faith in their completeness.

The general subject-matter of the book remains as in the first edition. It relates to industries concerned with changing the form of raw materials, and therefore excludes transport and commerce. Agriculture and certain other industries, dealt with elsewhere in the series of which this book forms a part, are also excluded.

One is struck with the vast amount of statistical material extant respecting the numbers and kinds of industrial undertakings, the persons, capital, and machinery employed, and the output. Of a great deal of this material Dr. Hesse has furnished an extremely useful summary. On the other hand, one also realises that large gaps still remain to be filled, the information either not existing at all or relating to periods often hopelessly out of date. Unfortunately, the latter deficiency tends to be somewhat exaggerated in the book before us. The facts relating to countries outside Germany are, in many cases, quoted second-hand from other German authors. This is perhaps natural, but it frequently results in the statistics (for example, those of imports and exports) being more out of date than they need have been, and, further, in being on the face of them not always consistent with one another. For example, the number of employed persons in industry and mining in the United Kingdom in 1901 is stated in a table on page 111 to be less than the number in England and Wales alone, as given in a table on page 122. These tables are extracted from other German publications, the authors of which have evidently classified the British Census results differently.

But it would be captious to continue to pick out faults of this description, of which the author is doubtless already conscious. It is more just to recognise the merit and utility of the book. The writing of a book of this character, and also its revision, are laborious undertakings, and every reader must feel indebted to Dr. Hesse for providing him with such a useful commentary on, and survey of, a large body of international statistics. A.D.W.

6.—1. *Les Employés en Allemagne. Leur situation sociale et leur Contrat d'Emploi, Législation et Revendications.* Par J. Buelens. xv+327 pp., 8vo. Anvers: "Veritas" Ch. et H. Courtin, 1913. Price 6 frs.

2. *Les Employés en Autriche. Leur situation et leur contrat d'emploi.* Par J. Buelens. 92 pp., 8vo. Anvers: Ch. et H. Courtin, 1914. Price 2½ frs.

The "working-classes," or, more correctly, the wage-earning classes, have long been the subject of study by economists, statisticians, and other persons, and have frequently received the attention of the legislature. The result is a mass of laws, such as Factory Acts and Trade Union legislation, governing the industrial activities of these classes or sections of them, and a body of fairly extensive knowledge, though still incomplete, respecting their means and mode of living. Of other classes in the community we know far less. One of these is the class composed of clerks, shop assistants, teachers, and other salaried persons occupying for the most part a subordinate place in the ranks of industry, commerce, and the professions. It is this class, with certain exceptions, in Germany and Austria, respectively, which forms the subject-matter of Professor Buelens' two books.

Apart from preliminary matter and appendices, the book on *employés* in Germany is divided into three sections, dealing with (*a*) the social and economic position of the class, (*b*) legislation on their contract of service, and (*c*) their complaints and demands respecting this legislation. Professor Buelens' material is well-arranged under these headings, and the book, although not entering into minute details, is very informative.

The first section is, from some points of view, the most interesting. The data available for describing the economic position of the class under consideration are very limited and meagre. The author's main sources of information are the results of a few isolated inquiries, official and otherwise, which are not strictly comparable with one another, but nevertheless yield interesting, though tentative, conclusions. For instance, the first chapter summarises some inquiries into the social origins of the new "frock-coated "proletariat," from which it appears that the bulk of this class, or at least of those covered by the investigations, come from the lower middle and superior classes, and only a comparatively small proportion from the "working-classes" (*ouvriers*). Hence the general outlook of the *employé* class is that of the middle class or bourgeoisie, and the working-classes are regarded as inferiors. This is in despite of the fact, revealed by statistics quoted in a later chapter, that the income and economic position of this class are in many cases below those of the better paid wage-earners. Other statistics are quoted respecting hours of work, which appear to be mostly 10 per day in shops and 9 in offices; Sunday work, which exists to some extent; and annual holidays, which are generally granted.

The second section of the book relates to the legal enactments, which, apart from the Civil Code, are of recent origin, affecting the terms of engagements or contracts of service, including duration of work, payment of salary, obligation of employers in case of illness, obligations arising on the termination of service, &c. In the third section the author reviews and criticises the claims of *employés* for further amelioration of their conditions, and also offers suggestions of his own for meeting some of the alleged grievances. It is not possible in a brief review to summarise the many points raised in such a study. The appendices contain extracts from the relevant German laws and a bibliography.

Information bearing on the social and economic position of *employés* in Austria—where they form a much smaller class than in Germany—appears to be extremely scanty. The most interesting facts quoted by the author indicate that salaries are on a lower level than in Germany, and that the proportion of females is growing rapidly. Special legislation in Austria on the conditions of employment of commercial clerks and other similarly situated persons dates from 1910. It is later than the German legislation, and is more advanced and comprehensive. The greater part of the book consists of a digest and explanation of this law, which is also quoted at length, and the general opinion thereon appears to be that the law is fairly satisfactory, although of course not perfect.

Legislative interference with the contracts and conditions of service of different classes of persons has always had its opponents. But such interference is now a *fait accompli*, and Professor Buelens' studies serve admirably to show its general working in the case of *employés* in Germany and Austria, and on the whole he gives it his approval. A.D.W.

7.—*Gesundheitliche Schädigungen der Frau bei der industriellen Arbeit unter besonderer Berucksichtigung einiger Betriebe.* Von Dr. Käte Winkelmann. viii + 95 pp., 8vo. Jena: Gustav Fischer, 1914. Price 2*s.* 6*d.*

This little work, which forms one of a series of monographs on politico-economic problems edited by Professor Conrad, succinctly describes the principal diseases associated with various industries, calling attention to the methods of prophylaxis which have been found most efficacious and to the difficulties which in practice impede the working of such methods. In the third section, which is the most original, the authoress details the results of some inquiries she made in Halle, and provides a sane criticism of the morbidity statistics available in Germany with suggestions for their improvement. The English reader will be gratified to notice that Dr. Winkelmann not infrequently contrasts German and English systems in a manner flattering to our national self-esteem. Dr. Winkelmann, is of opinion that the incidence of, for example, lead-poisoning is gravely under-estimated in certain towns. She instances the fact that inspection of a certain pottery works revealed six cases which had not figured among the notifications, because the doctor had returned them as saturnism.

Dr. Winkelmann's work does not profess to be much more than a compilation, but it is a useful compilation, and condenses a good deal of scattered knowledge. M.G.

8.—*The State and the Poor.* By Geoffrey Drage, M.A. 264 pp., 8vo. London: Collins, 1914. Price 1*s.*

This small and handy volume forms part of "The Nation's Library." No one could be better qualified by long study and practical experience than Mr. Drage to prepare a brief but comprehensive survey of the vast question to which it relates, on which (as he says) nearly 400 statutes, 5.000 judicial decisions, and departmental orders without number are to be observed by every Poor Law administrator. He comments with justice on the hopeless confusion which prevails in the domain of public assistance. In a brief introduction he shows that while the Report of the Royal Commission of 1832–34 was launched into successful operation within six months of its passing, the Report of the Royal Commission of 1905–9 has been followed by no comprehensive scheme of legislation, but has been in some respects practically superseded by several important statutes. Discussing the existing state of the law in detail, Mr. Drage shows that the number of vagrants resorting to casual wards has been much diminished, mainly by the system of way-tickets, so that the problem of vagrancy may be said to be within a measurable distance of solution. The mentally defective have been recently provided for under the Act of 1913, which is a genuine attempt to deal with a difficult question. The Old Age Pensions Act has had the effect of reducing outdoor pauperism to a considerable extent, though there are anomalies in its working which call for attention, and show that the right way of dealing with the aged poor has not yet been reached. Adult pauperism shows a tendency towards diminution during recent years, but is still higher than it was in 1909, and many of the problems arising out of it are still unsolved. On the question of female pauperism, Mr. Drage draws attention to the light thrown upon that subject by Miss Hutchins' paper on the statistics of women's life and employment in the *Journal* for 1909, and thinks that improved education and opportunity are rendering women more independent and self-reliant than formerly.

With regard to the condition of children under the Poor Law, Mr. Drage warmly advocates, as being the minor Poor Law Reform nearest to his heart, the transfer to the Metropolitan Asylums Board of the Metropolitan Poor Law Schools. He considers that "this step, which can be effected by a stroke of the pen of the "President of the Local Government Board, would render available "for the advantages of sea training on the *Exmouth*" training ship, with the management of which Mr. Drage has been associated for many years, "all the boys of good character and suitable physique "in those schools, to whom a life at sea, with all its adventures and "hardships, appeals."

On the subject of areas of administration, Mr. Drage forcibly sets forth the anomalies of the present system. In a concluding chapter, which is not a summary of those which preceded it, he urges that the aim of the Poor Law legislation of the future should be, not so much the removal of the existing pauper from dependence on the rates, as the formation of a new generation, which shall be, mentally and physically, fit. The problem involves the welfare and, above all, the self-respect of the poorer classes of the population. Mr. Drage's valuable work is calculated to render material help towards its solution. The book is illustrated by a good likeness of the author. E.B.

9.—*The Influence of Monarchs: Steps in a new Science of History.* By F. A. Woods, M.D., Lecturer in Biology in the Massachusetts Institute of Technology. xiii + 422 pp., 8vo. New York: Macmillan, 1913. Price 8*s*. 6*d*. net.

Dr. Woods, it may be remembered, is the author of a volume on *Mental and Moral Heredity in Royalty*, published in 1906, and noticed in the *Journal* for December of that year. In writing that volume the author had the double intention of studying the relative intensity of heredity and environment—a subject on which the present reviewer ventured slightly to differ from some of the conclusions—and of initiating the use of quantitative methods in the study of history. In the present volume similar quantitative or semi-quantitative methods are applied to the study of the great questions of national growth and decline.

The idea of the method used is simple enough. Each monarch is classed according to his intellectual qualities as + (distinctly superior), ± (mediocre), or — (distinctly inferior), moral traits being as far as possible left out of consideration. Thus Elizabeth is +, James I ±, Charles I ±, Charles II —, and so on. No strict mechanical or objective scheme based on the adjectives used by historians was employed. A similar three-fold classification of the condition of the country during the reign of each monarch (progressive +, doubtful ±, declining —) is then made, this research taking account of information on "finances, army, navy, "commerce, agriculture, manufacture, public building, territorial "changes, condition of law and order, general condition of the people "as a whole, growth and decline of political liberty, and the diplomatic position of the nation, or its prestige when viewed inter-"nationally. No attempt is made to include literary, educational, "scientific or artistic activities." When these classifications have been completed, contingency tables can be drawn up exhibiting the relation between the "class" of the monarch and the "condition of the country" during his (or her) reign. Thus England, 1066–1603, gives:—

Ruler.	Conditions.		
	+	±	—
+	8	4	0
±	1	2	2
—	2	1	7

while for the period 1603–1811 we have:—

Ruler.	Conditions.		
	+	±	—
+	1	0	0
±	3	0	0
—	6	0	0

For all the monarchs of all the countries considered (France, Castile, Aragon, Spain, Portugal, Netherlands, Denmark, Sweden, Russia, Prussia, Austria, Turkey, Scotland and England) the general summary is:—

Ruler.	Conditions.			Total.
	+	±	−	
+	105	27	11	143
±	26	31	19	76
−	30	18	87	135
Total	161	76	117	354

For this table, the author states, the correlation is about 0·60 to 0·70, and he places it at about 0·6 as a lower limit. After a detailed discussion of the results, his conclusion is that (p. 279), "It cannot be said that the monarchs caused the history or that "they caused the conditions. But it can be contended that the "*differences* between the conditions in one reign and the next were "caused by the differences between the monarchs; and this is the "quintessence of this research." "I have looked at the recorded "evidence from many points of view, with the wish to decide if the "observed fluctuations in material conditions of the various countries "could be due to the immediate influence of the sovereigns and have "come to the conclusion that this is the only explanation consistent "with all the observations" (p. 256). Put as briefly as possible the argument is (p. 256)—that the monarchs developed as they did owing to innate differences; that the conditions are correlated with the pedigrees; that the conditions could not cause the pedigrees, and therefore the monarchs are the result of the pedigrees, and the conditions (changes in conditions ?) the result of the monarchs.

Dr. Woods adheres to his former conclusion that modern royalty (from the tenth century onwards) is distinctly superior to the average European in capacity. The point does not seem essential to the conclusions in his present volume, but the question unavoidably arises in the reader's mind why, if this is so, the average appears from the summary table cited to be only very slightly above mediocrity. Surely if the "royal breed" were "superior to any "other one family, be it that of noble or commoner" there should have been a much more marked excess of those classed as + or distinctly superior.

The conclusions at which Dr. Woods arrives are put so forcibly that they almost stimulate one to find reason for disagreement; tables like those given are easier to construct than to interpret. The present reviewer, as already stated, was by no means convinced by his extreme view as to the almost entire unimportance of environmental influences, and that is a vital link in his chain of reasoning, nor does he feel convinced that the influence of a knowledge of the conditions on the judgment as to the monarch is not a serious source of bias. But differ as one may, the interest of the present research, and the importance of Dr. Woods' pioneer work in the application of statistical methods to the study of the general influences that have acted in the development of modern history, must be recognised. G.U.Y.

10.—*Economic Notes on English Agricultural Wages.* By Reginald Lennard, M.A. ix + 154 pp., 8vo. London: Macmillan, 1914. Price 5*s.* net.

Mr. Lennard has set to himself the questions, What are the causes of the local variation of agricultural wages, and What would be the effect of a statutory minimum wage? His analysis is very careful and very useful, and no one can afford to neglect the considerations he examines in his final chapter. There is, perhaps, little that is new in his discussion of the causes of low wages in certain eastern and southern counties. Are the labourers less capable, do they fail to do their best, are they underfed, are they paid less than their marginal worth? These are questions that everyone asks, and though for the answer to them even Mr. Lennard has found few data; he is prepared to express a fairly definite opinion. "There are good reasons for supposing that the cost of agricultural "labour is especially low in the counties where agricultural wages "are low. . . . On the other hand, it appears probable that "the variations in wages are not entirely due to differences in the "cost of labour, but should partly be attributed to differences in "its efficiency. These differences in the efficiency of the workmen, "however, may to some extent be regarded as produced by lack "of hope or willingness, or by the unwise direction of labour in "certain districts. And in so far as they are more deeply graven "than this, they appear to be due not to inherent racial qualities, "but to underfeeding. . . ."

If, then, a minimum wage was established above the ordinary rate of the low paid counties, would it pay for itself by inducing better work, would it fall on the farmer who had been making undue profits, or on the landlord who had received undue rent, or would it be met by a contraction in the amount of employment? Mr. Lennard is emphatic in his view that, even if labourers responded with greater efforts and earned the higher rate, the number employed would be decreased, if no other factors were involved. He deals very thoroughly with the proposal to compensate farmers for more costly labour by reducing rent, and holds with much plausibility that the result would be a simple transference of Ricardian rent from owners to labourers, and he would apparently prefer that landlords should be "openly taxed to provide a grant in aid of the "wages paid on their estates." There is inevitably a lack of quantitativeness in the treatment; all depends in reality in how many cases farmers are benefiting or are comfortably inefficient because of low labour cost, in how many the rent is lenient, in how many the labourer is underworked. It is quite possible that a very considerable number of labourers are obtaining less than their marginal rates, for want of combination and knowledge, and that consequently profits and rents are inflated above their competitive and Ricardian values; and, if this is the case, the compulsory raising of wages with the possibility of re-adjustment in the bargain between farmer and landlord involves no dole, but is only an act of leverage into the position that economists regard as fair. As our author says in a footnote, "the student of an abstract science like economics "requires to be always on his guard against the temptation to shrink from decision"; yet the reader cannot find whether he is in favour of any compulsory minimum or not, nor what he regards as the relative numerical importance of the numerous alternatives he discusses.

The treatment of the possibilities of increasing (or preventing diminution of) employment is more positive, and eight methods (all familiar) are instanced, viz.: an improvement in the class of farmers, better ordinary education, more technical information, co-operation, cheapening of transport, alteration of the game laws, improvement in the system of tenure, and adjustment of rates. By these methods we gather that the possible injury done by an enforcement of a higher minimum might be avoided.

There is an interesting table, based on original data, on pp. 57–9 showing to how great an extent farming is an hereditary occupation.

A.L.B.

11.—*The English Land System.* By J. A. R. Marriott, M.A. x + 168 pp., 8vo. London: John Murray, 1914.

Although as the author admits this is in a sense a *livre de circonstance*, the greater part of it was written before the "Land Campaign" was inaugurated. While, therefore, it contains some discussion of the more recent political aspects of agrarian questions, it consists for the most part of a clear and concise summary of the history of the land system, and the progress of agriculture in this country. As such it may be cordially commended to those who wish to inform themselves sufficiently to be able to consider current proposals with a general knowledge of the vital facts. On the historical side the author writes with authority and impartiality, and on those points about which historians differ—and they are somewhat numerous—his judgment will be accepted with respect. One slight slip may be noticed in his reference to Bakewell as the creator not only of the Leicester breed of sheep, but also of the Southdowns, which was, in fact, the breed which probably owed less than almost any other to him, its improvement being due to John Ellman. On another point a quotation is made which gives Coke of Holkham credit for bringing into cultivation 2,000,000 acres of waste land. As this is greatly more than the whole area of Norfolk, the statement can hardly be true of his direct influence, but it may perhaps represent an attempt to measure by a statistical estimate his indirect influence. This was very great, but it may be doubted whether Coke can be regarded as the "greatest name of all" among agriculturists. His work in the diffusion of sound principles and their practical application was second to none, but to Jethro Tull and Robert Bakewell belong the distinction of laying down the principles. Mr. Marriott makes free but somewhat indiscriminate use of statistics, some of those he quotes being of doubtful validity. But on the whole he has given in a handy compass an admirable statement of the salient facts of the land problem. R.H.R.

12.—*The relations of capital and labour.* By W. T. Layton. 264 pp., 8vo. London: Collins (The Nation's Library), 1914. Price 1*s.* net.

This is one of the best popular books that has appeared on the relations between capital and labour. It is popular in the best sense—not in the sense that it is fugitive and truckles to popular prejudice, but in the sense that it keeps throughout on the level of the non-expert reader (though on that level the argument is as thorough-going as it is possible to make it), and avoids what the ordinary man would condemn as "academic." Moreover, the style is easy and clear. The theory of wages is followed by some statistical support based on the movements of wages and interest over a lengthy period. Cost of living also receives ample notice, and the author then concentrates on the practical problems of collective bargaining, arbitration and conciliation, sliding-scales, profit-sharing, strikes, and so forth. In summing up as regards industrial policy, Mr. Layton emphasises (with Mr. Hartley Withers in his recent book) the harmful effects of luxury in keeping capital from productive uses, and urges the need of a greater equalising of opportunities and of requiring reliable information as regards the earnings of businesses. With respect to labour disputes, the policy of the Canadian Act in providing for impartial investigation is approved. Many of the conclusions are tentative, as the author holds that experience has yet to test rival theories in not a few cases; and some questions have had to be dismissed with little more than a statement of opposing views; but the book is quite courageously outspoken when the author has made up his mind, though one-sided judgment is noticeable by its absence. There are naturally points where disagreement may be expected. For instance, the statement may be questioned that the marginal theory of wages "holds good if competition "works out in detail in one industry" (p. 25), unless the author's meaning is misunderstood. If the marginal worth of labour is nowhere discoverable but in the tin-plate industry, is it not putting a severe strain upon common-sense to maintain that wages throughout England are really determined by the marginal worth of labour in the tin-plate industry? The book may be unreservedly recommended both to employers and employed. S.J.C.

13.—*The Cause of Business Depressions.* By Hugo Bilgram and Louis Edward Levy. xvi+530 pp., 8vo. London: J. B. Lippincott Co., 1914. Price 8*s.* 6*d.* net.

The last few years have been fertile in all countries in contributions to the discussion of industrial fluctuations. In America Mr. Hull's sprightly monograph and Professor Mitchell's monumental study have now been followed by the somewhat bulky and elaborate duet whose title is given above. The authors, while their avowed objective is the explanation of business depressions, have found it necessary to lead off with a "thorough-going analysis of the basic principles of political economy" and to conclude with a rapid cascade of pronouncements on a number of diverse topics such as bankruptcy law, protection, compulsory arbitration, anarchism, and the single-tax. The result is that the actual theory of the matter in hand is concentrated into one out of the eighteen chapters of which the book consists; it is not surprising, therefore, that most of the relevant considerations are either entirely omitted or given quite inadequate discussion.

The central conclusion of the authors is the time-honoured one that crisis and depression are due entirely to scarcity of currency. Interest, according to them, is paid not for the use of capital goods, but purely for the use of money, the only convenient mechanism by which the business man can make that selection and aggregation of capital goods which he requires. But the quantity of notes is (in America) directly, and that of bank credits indirectly, limited by law, while that of gold is limited by nature. Pure interest is, therefore, a monopoly price exacted by the creators of currency, for which there is no natural necessity, but which results solely from antiquated legal restrictions. The free "monetisation of credit" would result in the disappearance of interest and of trade depressions, and would have the further advantages of facilitating the speedy transfer of land values to the State and of enabling the execution of public works on a colossal scale without the inconvenience of contracting a public debt.

How simple it all seems, as long as we do not stop, for instance, to inquire why depressions occur in England where the volume of bank credits is not even indirectly limited by law, or what the evidence is of that permanent plethora of real capital crying out to be borrowed gratis which is the basis of the authors' optimism! But the extraordinary theory here presented scarcely needs formal refutation, even if there were space for it. Nor need we follow the authors in their exciting chase after that wary old bird, the quantity theory of money, nor in their proposed plan of currency reform, except to observe that it is vitiated throughout by the confusion between the problem of keeping paper money at a par with gold and the problem of keeping a stable value of currency in terms of commodities. It is pleasanter to draw attention to the two respects in which they allow some light to fall on an admittedly obscure problem. First, the distinction between the payment of interest for the use of capital goods and the payment made to bankers for dispensing control over the same is a sound and useful one, as long as it is not assumed that the former is a mere chimera, and the latter an extortionate fee for looking on at a conjuring trick with ink and paper which any fool could perform for himself. Secondly, it is quite true that during the depression, though not during that earlier stage of crisis which, like so many others, the authors fail to distinguish from depression, there is an abundance of real capital (commonly described as a "general overproduction") whose use in investment is partly, though only partly, hindered by a comparative scarcity of the circulating medium; though it is *not* true that this scarcity is the result of monopoly exploitation.

The book concludes with twenty-six diagrams, of which No. 5, entitled "Evaluation of Wine," perhaps takes the palm for decorative merit. D.H.R.

14.—*Les Règlements par Effets de Commerce en France at à l'Étranger.* Par Gaston Roulleau. vi+204 pp., large 8vo. Paris: Dubreuil, Frèrebeau et Cie., 1914. Price 7 fr. 50 c.

This interesting study obtained a prize recently offered by the Statistical Society of Paris. As M. Faure states in the report, of which an extract is furnished by way of Preface to the monograph, it was fitting that a prize founded in memory of a man who had attained a high position in the banking world of France (M. Émile Mercet) should be won by an essay of such a character on such a theme. He notes the significant fact that the writer has kept the statistical aim of his investigations primarily before his eyes throughout to the appropriate exclusion, or strict subordination, of the juridical, historical, or economic, aspects of the phenomena into which he has inquired; and he bestows the high praise that they deserve on the clear plan of arrangement which is followed and the lucid and attractive style of composition which is adopted. After briefly but adequately describing the important part played by the documents generically known as "effets de commerce," and embracing such important particular species as bills of exchange and cheques, both in the internal business of France and in international trade, the author proceeds to his main subject. He tries to ascertain the composition of the mass of such instruments in circulation in his own country, their geographical distribution, and the duration of their currency. The rate of discount charged and the nature and extent of the use of cheques receive proper attention; and then the inquiry is directed to the circumstances attending the conclusion as well as those presented at the outset or during the continuance of the life of these convenient substitutes for metallic and paper money. The measure in which they are honoured, and the degree in which default is made, are noted; and from France M. Roulleau turns his attention to foreign countries.

His difficult and useful work appears to have been executed with pains and skill; and he has brought together into a compact shape a mass of interesting and valuable information. The foundations of his detailed inquiry into the French statistics have been laid in a personal examination made, not at hazard, but so deliberately contrived as to be representative of some eight thousand documents bearing some twelve thousand stamps. It would appear from the figures that an increase of some 710 per cent. has taken place in the annual issue of these instruments between 1842 and 1912; but such an increase cannot be treated, as he pertinently and shrewdly observes, as an accurate measure of the development of French commercial activity. For, while a progressive division of labour would tend to augment their number, the habit of integration, which has become more and more prominent and familiar a characteristic of business organisation, would cause, on the contrary, a diminution. His estimate of the proportion to the total of the deeds stamped of those relating to domestic and international trade respectively yields about a half for each class. The average duration of currency of a cheque is also carefully calculated by him, and this process affords an additional example of the great pains given and the considerable ability devoted to the Essay. It should form, we think, a permanent contribution to statistical literature.

L.L.P.

15.—*Corporate Promotions and Reorganisations.* By Arthur S. Dewing, Ph.D. Harvard Economic Studies, Vol. X. viii + 615 pp., 8vo. Harvard University Press, 1914. Price $2 50 c.

This book is a study of twelve large amalgamations and of the Westinghouse Electric and Manufacturing Company and the American Glue Company, which were "in no sense industrial consolidations." In each case the trade conditions leading up to amalgamation of competing firms are analysed, the methods of promotion set forth, the early financial history detailed, and the reorganisation expedients described which were adopted to avert the results of failure. The studies are not exhaustive, but the cases "have been selected for their importance, and for the specific forms of failure and reorganisation they illustrate." The three last chapters gather together the facts supplied by the detailed investigation, and form an admirably succinct history of the rake's progress from promotion to reconstruction. Two cycles of consolidation are disclosed, culminating respectively in 1891 and 1899, and each marking the crest of a wave of prosperity when there was a large demand for credit and at the same time a large supply of money seeking investment and when confidence in railway securities had been shaken. The two motives to promotion were the desire "to allay the disastrous effects of competition" and the hope of bringing into existence "improved and economical methods of manufacture through production on a large scale." At the time the companies described were formed they controlled from 17 per cent. (National Salt Co.) to 85 per cent.

(Glucose Sugar Refining Co.) of the industries concerned, or 54 per cent. on the average. The "buoyant optimism" of the promoter led to excessive capitalisation. "On the average 40 per cent. of the par value of the total issued securities represented actual tangible property." "Looking at the matter in terms of a typical promotion, it would appear that of the 60 per cent. in securities above the value of the property, 10 per cent. went to the promoter for his service, 10 per cent. to the banker for his services, 20 per cent. to the manufacturers as a gift in excess of the value paid for their plants, 15 per cent. to the public as 'bait' to induce the purchase of the securities, and 5 per cent. for the direct labour incident to incorporation. Such figures represent the roughest approximation." Where bonds were issued the necessity of paying a fixed amount of interest has proved burdensome or even fatal to the enterprise. Dr. Dewing has been "impressed throughout by the powerlessness of mere aggregates of capital to hold monopoly," and "by the tremendous importance of individual, innate ability, or its lack, in determining the success or failure of any enterprise." The control of a gigantic business requires talents of the very highest order and, above all, width of vision. The Standard Oil Co. succeeded "because the directors always built for the future, never the present alone," putting fully half the annual earnings into new equipment. "It was a question of imagination and it is such imagination which the usual promoter lacks." With this quality goes conservatism which prevents the squandering of earnings in immediate dividends for the purpose of enabling first holders to unload their holdings of stocks. Nemesis comes sooner or later, generally sooner, and then there is a struggle to put off losses on to other shoulders, or to absorb the competitors created by the price-raising policy of the directors.

It cannot be said that Dr. Dewing's history arouses in us any feelings of respect for the American "big business" man, or any trust in the American financier, or any commiseration for the American public which allowed itself to be so easily gulled. Occasionally all seem to have been participating in a vast confidence trick, and frequently the public was not the only victim. Dr. Dewing's book will rank high in the literature of the trust movement; it is in every way worthy of the University under whose auspices it is published. H.W.M.

16.—*L'Industria Domestica Salariata nei Rapporti Interni e Internazionali.* By Federico Marconcini. With Preface by Achille Loria. 847 pp., 8vo. Turin: F. Bertinatti, 1914. Price 12 l. 50 c.

This substantial work deals in a very full and interesting manner with the character and extent of homework in Europe and America. In a brief historical sketch the author describes the changes in industrial organisation which caused the gradual disappearance in most branches of industry of the independent artisan producing directly for the consumer, and the growth of the class of workpeople employed by *entrepreneurs*, and shows how the latter class falls into the two main groups of factory operatives and homeworkers. A full account is given of the number of homeworkers in the principal civilised countries and the trades in which they are mainly engaged. In this connection it is urged that homework is not a mere survival, but an essential element in the modern industrial system. It is pointed out—and this is emphasised in Professor Loria's preface—that employers derive many important advantages from homework, chief among them the saving of heavy establishment charges, which is of special importance in the case of seasonal trades in which expensive plant would be liable to long intervals of idleness.

There follow chapters on the wages and general conditions of labour of homeworkers. The section on wages, being based largely on inquiries by persons or associations interested in the amelioration of the condition of underpaid homeworkers, gives undue prominence to the classes of work in which wages are particularly low, while the more highly paid branches of homework tend to be overlooked. In the case of men homeworkers especially it ought to be remembered that homework is by no means synonymous with low wages; *e.g.*, journeymen tailors in England and machine embroiderers (men) in Switzerland are among the best paid workmen in their respective countries. Conversely, factory work does not necessarily connote high wages, since there is a large number of badly paid female factory operatives.

Neglect of these considerations has led to a confusion which is the chief fault of Signor Marconcini's book. He has failed to discriminate sufficiently between conditions that are peculiar to homeworkers and those which are found amongst factory workers as well. Thus, in tracing the causes of low wages, prominence is given to the facts that many women only work in order to get pocket money or to supplement the family income, and that a large proportion of women workers look forward to marriage and consequently make no attempt to learn a skilled trade which would enable them to earn a living wage. But it is obvious that these causes operate in the case of women workers in general, and of course they have no bearing on the position of men homeworkers.

After an exhaustive discussion of the remedies which have been proposed from time to time for the evils attendant on homework, Signor Marconcini arrives at the conclusion that the intervention of the State is necessary in two directions, first, to extend to homeworkers in fuller measure the legal protection which has been generally accorded to workers in factories and workshops, and secondly, to regulate rates of wages. Special attention is devoted to the Australian minimum wage legislation and to the English Trade Boards Act of 1909, the discussion of which, in spite of some inaccuracies in matters of detail, is on the whole adequate. Signor Marconcini should, however, have more strongly emphasised the fact that the Australian and English minimum wage legislation is in no way restricted to homeworkers, who form, indeed, only a minority of the workpeople affected by it. S.L.B.

17.—*Social Insurance.* By I. M. Rubinow. vii + 525 pp., 8vo. London: Williams and Norgate, 1913. Price 12*s.* 6*d.* net.

The author of this work had had experience as a statistical expert in the United States Bureau of Labour. His present position appears to be that of Chief Statistician in the Ocean Accident and Guarantee Corporation at New York City, and the book has grown out of a course of fifteen lectures on the subject of Social Insurance delivered by him in 1912 at the New York School of Philanthropy. He explains that the material of these lectures has been considerably extended, re-written, and brought up to date. Though the book has an English publisher, it would appear to have been written primarily for American readers, and is copyrighted in the United States by Messrs. Holt and Company.

Mr. Rubinow rightly considers that the term "Social Insurance" as now generally used requires to be better understood than it is at present by English-speaking nations. All insurance is social, as it substitutes co-operation for individual provision: and the principle of insurance is well understood as a system by which the risks of life are averaged among all the persons exposed to them, so that those upon whom they fall are compensated out of the contributions of those who escape. Where those contributions are the actuarial equivalent of the risk, that is the class of insurance termed commercial insurance; but there are risks affecting large classes of the population against which they are unable for want of means to insure by the payment of an actuarially equivalent contribution, and the extraneous means by which that insurance is to be provided constitutes the problem that is involved in the term social insurance. Mr. Rubinow deals with this problem under four heads: insurance against industrial accidents, against sickness, against old age, invalidity and death, and against unemployment. All these are means of giving relief in case of destitution, but he urges that this relief is not to be looked upon as a system of public charity organisation. He holds that the ideal purpose of social insurance is to prevent and finally eradicate poverty.

Mr. Rubinow's definition of social insurance is open to the objection that it excludes the voluntary Friendly Societies, which ask nothing from the State but to be left alone to do their own work in their own way, and claim the right to be self-supporting. He repeats many of the exaggerated attacks upon these bodies which were used to justify their virtual supersession in this country by the establishment of a subsidised system of insurance and of methods of control and interference that are destructive of their voluntary character. Mr. Rubinow does not, however, ignore the weaknesses that beset the new system. He arrives at the conclusions that all the branches of social insurance have not yet been developed in any country, that scarcely any known system, not even the English or the German, includes all classes of workers; and that the systems of social insurance in general provide inadequate relief. E.B.

18.—*Principes d'Économie Pure.* Par B. Antonelli. ix + 206 pp., 8vo. Paris: Marcel Rivière et Cie., 1914. Price 5 fr.

This treatise, as the Preface by Professor Renard indicates, and the first of the two sections, into which it is divided, written by the author himself, shows with greater fulness, is, in the main, a statement, for the benefit of French students, of the chief points in the account of economic principles put forward by the distinguished mathematical economist, Léon Walras. It has indeed in a sense a pathetic note; for we gather from these introductory observations that, so far as France is concerned, Walras, like many other men of eminence, has been a prophet who did not receive in his lifetime the honour that was due in his native country. But his latest disciple and expositor has in this volume sought to render ample justice to the considerable deserts of his master.

The account which he furnishes here of the teaching of the Lausanne Professor is perhaps specially important, because he draws a distinction between two varieties of the mathematical treatment of Economics—one which is "psychological" in its starting-point and confessedly is based on utilitarian ideas of the dominance of pleasure and pain as motives prompting to, or deterring from individual action, and the other, which is primarily concerned, as the title-page of this treatise itself announces, with "the theory of exchange under the regime of free competition." It was this latter aspect to which Walras devoted his attention, while the "hedonistic calculus," as it has been termed, is more conspicuous on the pages of other writers, such as Jevons. M. Antonelli, in his suggestive discussion of the objections brought against the mathematical treatment of economic theory contends with force that some at least of that criticism is more peculiarly applicable to the psychological variety; but it is to be noticed, as he himself admits, that the notion of maximum satisfaction, which must from its very nature, be largely "subjective," finds of necessity an early place even in the expositions of mathematical economists of that contrasted school to which Walras belonged.

As he argues, much of the common animadversion often made by the uninstructed on the method as a whole is met by the statement that the theory concerned is the pure theory of Economics; and he shows once again, in the second section of this book, the great advantage of precision that accrues from such treatment. Yet the neatness and conciseness of the exposition here set forth on the lines laid down by Walras do not convince us that recent developments in this direction, in other countries more noticeably indeed than in France, are devoid of serious danger. We are afraid that a popular interest in economic study bids fair to be destroyed, if it is frightened away by excessive technicality; and that this repulsion represents a great loss both for the professional economist and for the lay public. The loss is inadequately compensated by the wholesome abstention of the uninstructed from rough awkward meddling with delicate refinements. M. Antonelli, however, is entitled to claim that, after his death at any rate, the ideas, with which Walras is connected, have attained a growing influence; and his pious affection for his master cannot but elicit our appreciative respect. L.L.P.

19.—*Political Economy.* By Charles Gide. Authorised translation under the direction of Professor William Smart by Constance H. M. Archibald, M.A. xiii + 762 pp., 8vo. London: George G. Harrap and Co., 1914. Price 10*s.* 6*d.* net.

We welcome heartily this needed translation of one of the best of text-books on economic principles. It is true that for some time past an English, or rather an American, version of an earlier manual from the same source has enabled students on this side of the Channel to make a pleasant acquaintance with the approved conclusions of economic theorising under the sure and skilful guidance of M. Gide, and it is also the case that the volume now before us is a reproduction of a work on a somewhat greater scale than that previously translated and was intended primarily for those preparing for the examinations of the Faculty of Law at Paris. But there were certain defects, most noticeably perhaps in the illustrations inserted for the benefit of Transatlantic readers, in the former book, in the only shape in which it was accessible to those ignorant of the French language, and the larger size of the present publication, permitting, as it does, of a more complete and detailed statement, is nevertheless not, we think, beyond the appropriate demands of a very extensive class of students. Executed as the translation has been under the direction which is stated on the title-page, with the great additional benefit of the latest careful revision of his original treatise by the author himself, it is, we are confident, sure to be widely circulated and gratefully received.

The merits of Professor Gide's exposition of economic science have already earned in this country the high testimony of sustained popularity alike with teachers and with pupils. To a remarkable power of lucid attractive statement he has brought the further recommendations of a great store of apt and accurate knowledge and of a cool decisive judgment. His admirable sense of proportion has been no less evident in the detailed treatment of the separate sections into which he has divided his presentation of the subject than in the primary conception of his general plan. No student can entertain a doubt of the author's own opinion on disputed points; and generally, if not invariably, he will feel that he will be right if he accepts, and wrong if he disagrees with, the conclusion reached. But he will remain no less certain that adequate opportunity has been afforded for knowing and judging at first hand what has been said for and against a debated position by the chief authorities. With a command of the history of the past development of thought on economic topics the erudition of his teacher is as fully equipped as his open and alert intelligence is obviously continually alive to the benefit and need of being abreast of the most recent pertinent suggestions of contemporary workers. But a sane as well as a comprehensive attitude is adopted and preserved throughout; and each contribution to knowledge finds its suitable place in an orderly balanced system. Professor Gide seems to us, if we may say so, to combine the merits, while he escapes the defects, both of a conservative and also of a progressive treatment of his theme.

What we have thus observed, and believe to be the characteristic note, of the book, of which this opportune translation into English is now available, constitutes in our opinion, the highest eulogy we could bestow. For students at any rate who will continue and extend their study of Economics it is bewildering to be confronted at the outset with a manual conceived and executed on such revolutionary lines that a subsequent acquaintance with older writers will launch them unprepared on an unfamiliar sea of the currents or the shores of which they can have no knowledge to enable them to direct their course aright. And hence, the complete dislodgment or neglect of earlier thought is, to say the least, a hazardous experiment. But, on the other hand, even from the beginning the pupil should not be allowed to think that he has no concern with criticism or amendment. He must not be permitted to regard the study on which he has embarked as stationary. He should be stimulated to observe and reflect and be sure that the area of possible learning has been confined within no narrow boundaries. Professor Gide's exposition appears to us to satisfy this dual test. In the suitable mode in which the treatise is mapped out he has known how to combine a general conformity with the main outlines of earlier schemes with a due recognition of the modifications needed by later developments; and, similarly, throughout the successive sections, he has wisely and skilfully contrived to introduce and incorporate the new without omitting or extirpating the old. He has sought and we would be bold enough to pronounce confidently that he has attained a "golden mean."

L.L.P.

20.—*Grundzüge einer Theorie der Lebensversicherung.* By N. R. Jörgensen. Copenhagen. x + 408 pp., 8vo. Jena: Gustav Fischer, 1913. Price 12*s*.

This book covers practically the whole of the theory of Life Insurance. It is very far, however, from being merely a text-book for those engaged in the practice of insurance. Certain parts of it, indeed, should appeal quite as much to the members of that increasing band of students interested in vital statistics, even though they may not have the technical knowledge of the professional actuary.

The volume is readily divisible into two parts, of which the second, dealing in detail with the financial side of insurance matters, is likely to appeal less to the average statistical student than the early part, which treats of the demographic side. This includes a general description of the method of construction of mortality tables and some summary of English and continental tables. In the former the questions of graduation and interpolation are dealt with, the processes evolved by the English actuaries being fully described. The book appears to be very thorough in its treatment of the various parts of the subject. In discussing the Makeham formula, for instance, five distinct methods are described for its practical use, including those of Hardy and King. The reproduction of many tables, both English and continental, gives material in convenient form for useful comparison. To those familiar only with national vital statistics, showing invariably an increase of mortality with age from the early teens, it will come, at first sight, as some surprise that the mortality of insured lives diminishes from age 20 to a minimum (in the case of the experience of 23 German companies) at age 26, and increases only from the latter age, but the result is, of course, readily accounted for by the selection performed by the companies.

In spite of the fact that much of the progress in the medico-actuarial field has been through the work of British actuaries and statisticians, the literature on the subject in our language is very meagre. This book, if translated, would occupy an intermediate position between the text-book of the Institute of Actuaries and the recent little volume by Messrs. Elderton and Flippard, approaching, however, more nearly to the former. Its value to the English reader is enhanced by a very complete index, both of subjects and of names. E.C.S.

21.—*A Theory of Interest.* By Clarence Gilbert Hoag. xi + 228 pp., 8vo. New York: Macmillan, 1914. Price 6*s.* 6*d.* net.

Mr. Hoag's fundamental thesis is that the real basis of interest is not a discounting of the future as future, but the fact that the duration of life and the degree in which men identify their heirs with themselves are limited. It is not so much the uncertainty of the future which causes it to be relatively disregarded, as the certainty that beyond a point it will not be a future in which any people now living can participate, and the certainty that, when the interests of successors are cared for, concern for their future will thin out as the time to which it relates becomes more remote. In the opinion of the reviewer this is one of the chief causes of interest, though not the sole cause. The general idea is not entirely novel, but the detailed exposition, which seems to be convincing so far as it goes, is original. The book concludes with an attack on opposing theories—which is sufficiently telling without the adventitious aid of italics and very large type to stress the author's points. It might be objected that Mr. Hoag is somewhat deliberate in getting to grips with his subject, and that the introductory analysis of value, suggestive as it is, disturbs the balance of the book. Mr. Hoag will be heard of again. S.J.C.

22.—*I Prezzi nella Industria Cotoniera.* Da Costantino Ottolenghi, Prof. Ord. nell' Università di Camerino. iv+222 pp., 8vo. Turin: S. Lattes and Co., 1914. Price 6 lire.

This is a work of considerable statistical and practical interest. Professor Ottolenghi was commissioned by the Italian Ministry of Agriculture, Industry and Commerce to make a statistical study of the prices of cotton goods in Piedmont in 1910. As a preliminary to presenting the statistical information collected, the author reviews and criticises the methods employed in the principal inquiries into prices previously made in Italy, and discusses the methods followed in the most important investigations of this character in England, Germany and America. He then proceeds to explain the plan followed by himself in the inquiry under review, and to set out the results obtained with respect to the prices of cotton yarns, piece goods and hosiery.

An interesting point brought out by the statistics is that, while the prices of all classes of yarn fluctuated considerably during the year to which the inquiry related (1910), and rose considerably towards the end of the year, the fluctuations in the prices of doubled, bleached and dyed yarns, after making due allowance for the cost of doubling, &c., did not correspond at all exactly with those of ordinary grey yarn. The suggestion may be offered that this lack of correspondence is partly due to the fact that the doubled and dyed yarns on the market at any given date were spun some little time before the ordinary yarns, so that the price movements of the former would naturally lag some distance behind those of the latter. It must also be remembered that the more elaborately an article is worked up, the more specialised is the demand which it supplies, and it is not to be expected that the demand of a special market will always move in sympathy with that of the general body of consumers. With regard to piece goods, it is shown that the price movements in the case of grey cloth corresponded more or less roughly with those of yarn, while there was no such correspondence in the case of the prices of fancy goods. The price fluctuations of hosiery appeared to be quite independent of those of yarn, largely on account, as Professor Ottolenghi observes, of independent causes, such as seasonal changes in demand, which tend to obscure the connection between prices of manufactured articles and the raw material from which they are made.

There follows an examination of the prices of several classes of yarn and cloth quoted on the American, English and German markets during the last twenty or thirty years, and of the prices quoted in these markets during the year of crisis 1910; and after setting out the statistical material collected, the author proceeds to a discussion of the most suitable methods of measuring variations and variability, in order to discover the character and degree of the relationship between the various price movements.

An analysis of the statistics shows that the prices of cotton goods move in cycles of some three or four years' duration; from the period 1890-93 to the period 1907–10 there are six distinct cycles, each including a period of falling prices followed by one of rising prices. These movements in the cotton trade correspond with the movements in the general level of prices, a falling tendency being observed from 1881 to 1898, followed by a rising movement from 1899 to 1910. It is interesting to note, however, that whereas cotton prices and general prices fell at about the same rate in the former period, cotton prices rose much more rapidly than general prices in the latter period. Professor Ottolenghi derives from these observations the generalisation that in each great industry there are price cycles independent of the general movement of prices, which is itself the result of the price movements in the several industries. Within the larger price movements in the cotton industry there are numerous fluctuations in the course of each year, and Professor Ottolenghi discovers a certain seasonal regularity in these fluctuations in respect of each of a number of groups of cotton products, though, as shown in the special inquiry into the prices in Piedmont in 1910, the seasonal movements of the several groups differ from one another.

In the concluding section of the book it is shown that, while the American cotton crop varies from year to year, there is a clearly marked tendency for it to increase. On the other hand, the price of raw cotton shows a downward tendency from 1880 to 1899, and an upward tendency from 1899 to 1911. The yearly fluctuations in price, however, correspond inversely with the fluctuations in production, a reduction in price corresponding with an increase in the crop, and *vice versa*, though there appears to be no relationship between the extent of the increase in production and that of the decrease in price in any year. Turning to the annual consumption of cotton, we perceive that there is a steady tendency to growth, and, further, that there is no constant relationship between prices and consumption. Indeed in some years of low prices a comparatively small proportion of the crop is consumed, while in some years of high prices almost the whole of the available supply of cotton is consumed. The underlying causes which regulate production, consumption and prices, and account for the discrepancies noted, are found in the changes in general economic conditions, and Professor Ottolenghi produces valuable statistical evidence of the relationship between economic cycles and the general variations in the prices of cotton goods. S.L.B.

23.—*Problems of Empire.* By Viscount Hythe. New Edition with a Foreword by the Right Hon. Earl Grey. xvi+217 pp., 8vo. London: Longmans, Green and Co., 1913. Price 5*s.* net.

This new edition of Lord Hythe's articles and addresses in which, as the title-page indicates, the "faith of a Federalist" is exhibited, appears enriched with a brief but suggestive "foreword" by Lord Grey. He justly calls attention to the "ability" and "perseverance" with which the author has tried to "enlighten" an "apathetic British Public on the subject of Federalism," and he correctly adds that the fresh issued is made at "an opportune "moment when the public mind is occupied with the questions "therein discussed." The Irish Home Rule Bill, to which Lord Grey refers, has certainly raised in an acute form a knotty problem of which others besides Lord Hythe have urged that a "federal "solution" is the only satisfactory settlement; and the readers of the forcible and lucid papers collected in this volume will find in them an unbiased comprehensive statement of deliberate opinions, based on diligent study and extensive knowledge, of a number of important aspects of the question. Lord Hythe may now occupy, to his credit perhaps it may be said, the position in many respects of a "cross-bencher," whose views do not appeal strongly to either of two opposing parties; but of the consistency and vigour of his particular "faith" no doubt can be felt; and accordingly no one, be he active politician or detached bystander, who takes up this volume, will, we think, lay it down without being grateful for the opportune stimulus he has received to honest careful thought.

He will respect, while he does not agree with, the author.

L.L.P.

24.—*Other New Publications.**

Ashley (*William James*), M.A. Economic Organisation of England: an outline history. Lectures delivered at Hamburg. viii + 213 pp. 8vo. London: Longmans and Co., 1914. Price 2*s*. 6*d*. net.

[These lectures were delivered at the Colonial Institute, Hamburg, towards the end of 1912, and are on the lines of a brief course which the author has been in the habit of giving at Birmingham University. The lectures, eight in number, were on the following subjects:—1. The English Agrarian System: The Manor as Starting Point. 2. The Stages of Industrial Evolution: The Gild as Starting Point. 3. The Beginnings of Modern Farming: The Break-up of the Manor. 4. The Rise of Foreign Trade: The Advent of Capital and Investment. 5. Domestic Industry and Tudor Nationalism. 6. Agricultural Estates and English Self-Government. 7. The Industrial Revolution and Freedom of Contract. 8. Joint Stock and the Evolution of Capitalism. There is also an appendix containing suggestions for further reading, and an index.]

Bachi (*Riccardo*). L'Italia economica nel 1913. (Supplement to Parts 6 and 7 of "La Riforma Sociale.") 313 pp., 8vo. Torino, 1914. Price 5 lire 50 c.

[This is the fifth year of this publication, and, as in earlier years, it gives a careful record of the commercial, industrial, financial and other economic activities of Italy during the past year.]

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* See also "Additions to the Library," page 911, *sqq*.

Bailward (*W. A.*), M.A. Recent Developments of Poor Relief. (Reprinted from "Economic Journal," December, 1912, with Postscript (1914)). 46 pp., sm. 8vo. London: P. S. King and Son, 1914. Price 6*d*.

[The author remarks that until a few years ago it was possible, by reference to the statistics of the Local Government Board, to ascertain the extent of poor relief, but that this is no longer possible. The principal Acts which have been the cause of this change are the Unemployed Workmen Act of 1905, the Provision of Meals Act of 1906, the Old Age Pension Act of 1908, and the (Education) Administrative Provisions Act of 1907. The statistics dealing with the working of the above Acts, the author contends, are confused with those of other branches of administration, and his object is to examine the relations of these various forms of public relief to one another and to watch their general tendency.]

Brown (*John Calvin*). The cure of poverty. 360 pp., 8vo. London: Stanley Paul and Co., 1914. Price 5*s*. net.

[Advocates a Protective Tariff as a remedy for the present burdens of taxation and as a means of raising the revenue for national defence and social reform. The book is written in a lively style, in refreshing contrast to much of the literature of this kind.]

Bulkley (*Miss M. E.*). The Feeding of School Children. With introductory note by R. H. Tawney (Ratan Tata Foundation). xvi + 278 pp., 8vo. London: G. Bell and Sons, 1914. Price 3*s*. 6*d*. net.

[An inquiry made during the year 1913 into the working of the Provision of Meals for School Children Act, which was passed in 1906. The book reviews the efforts which were made by voluntary and other agencies prior to the passing of the Act. It describes its administration in the country generally, and specially in London, and its effects on the welfare both of the children themselves and of the general community are examined. The provision of meals for school children, which was extended to Scotland in 1908, is described, and there is a short account of the systems of school feeding existing in certain foreign countries.]

Craik (*Sir Henry*), K.C.B., M.P. The State in its relation to Education. New and revised edition. xiv + 196 pp., 8vo. London: Macmillan and Co., 1914. Price 3*s*. 6*d*. net.

[This edition (the third) has been revised throughout, certain details relating to conditions which have ceased to exist being omitted. Recent legislation is reviewed at length, and the development step by step of the State's action in regard to education is described, while the dangers which may arise from the increasing intervention of the State are also discussed.]

Davenport (*C. B.*). Statistical Methods with Special Reference to Biological Variation. Third, Revised Edition. viii + 225 pp., sm. 8vo. New York: John Wiley and Sons, 1914. Price 6*s*. 6*d*. net.

[The second edition of this book was reviewed in the *Journal* for December, 1904, and the present edition is practically a reprint of the second with certain revisions.]

Elderton (*W. Palin*) and *Fippard* (*Richard C.*). The Construction of Mortality and Sickness Tables: a Primer. vi + 120 pp., sm. 8vo. London: A. and C. Black, 1914. Price 2*s*. 6*d*. net.

[A description of the usual methods of constructing mortality and similar tables. The author brings together and describes in simple language the methods of construction of such tables from censuses and death registers, and from information in the hands of insurance companies and friendly societies. Where necessary, arithmetical examples are given, in order to avoid the introduction of algebraical *formulæ*. A useful text-book for actuarial students, and those interested in modern social legislation.]

Herbertson (A. J.) and *Howarth (O. J. R.)*, Editors. The Oxford Survey of the British Empire. General survey including administration, legal problems, history, defence, education, . . . vi + 386 pp., 8vo. Oxford: Oxford University Press, 1914. Price 14*s.* net.

[This is the sixth volume of a series which has been prepared to give a survey of the British Empire and its constituent parts in their geographical and allied aspects, with their economic, administrative and social conditions at the present time. The nine chapters of the present volume are contributed by different authors, with the exception of chapter v, on Imperial Defence, which is unsigned. There is an Appendix of General Statistics, compiled by Mr. H. Macfarlane, and an index.]

Mayr (Dr. Georg von). Statistik und Gesellschaftslehre. Erster Band. Theoretische Statistik. Zweite umgearbeitete und vermehrte Auflage. (Aus Handbuch des Oeffentlichen Rechts: Einleitungsband.) vii + 357 pp., 8vo. Tubingen: J. C. B. Mohr, 1914. Price 9 marks.

[The first edition of this book was reviewed in the *Journal* for March, 1895. The present edition has been enlarged, revised and generally brought up to date.]

Pearson (Karl), F.R.S. Tables for Statisticians and Biometricians. Issued with assistance from Grant made by the Worshipful Company of Drapers to the Biometric Laboratory, University College, London. lxxxiii + 143 pp., 4to. Cambridge University Press, 1914. Price 9*s.* net.

Pearson (Karl), F.R.S., and *Jaederholm (Gustav A.)*. Mendelism and the Problem of Mental Defect. II. On the Continuity of Mental Defect. With four diagrams. Questions of the Day and of the Fray, No. VIII. 47 pp., 8vo. 1914.

Ricci (Umberto)—

Sulla Media Aritmetica Ponderata. 44 pp., 8vo. Torino, 1912.

I Limiti della Statistica. 29 pp., 8vo. Rome, 1913.

[A reprint from the "Rivista Italiana di Sociologia" for Sep.–Dec., 1913.]

Sulle Divergenze fra Statistiche del Movimento Commerciale. 78 pp., 8vo. Torino, 1914.

[A reprint from the "Riforma Sociale" for 1914.]

Williams (M. H.), M.B., *Bell (Julia)*, M.A., and *Pearson (Karl)*, F.R.S. A Statistical Study of Oral Temperatures in School Children, with special reference to Parental, Environmental and Class Differences. Drapers' Company Research Memoirs. Studies in National Deterioration. IX. 124 pp., 4to. 1914. Price 6*s.* net.

Sweden. Annuaire statistique de la Suède. 1ère Année 1914. 8vo. Stockholm: P. A. Norstedt and Söner, 1914.

[Though the Swedish Central Statistical Bureau have published for many years a *résumé* of the official statistics of Sweden, the present volume is the first bearing the above title. The scope of the work has also been much enlarged, and by giving the headings of the tables in two languages (Swedish and French) the utility of the book as a work of reference has been greatly increased.]

International. Annuaire Statistique des Grandes Villes Européennes rédigé par le Professeur Dr. Gustave Thirring. I^e^ Année, I^e^ Partie. 95 pp., 8vo. Budapest, 1913.

[This publication forms a part of the "Annuaire" which it is intended to compile with the moral support of the International Statistical Institute and the help of the municipal statistical offices of all large towns. The present issue was somewhat hurriedly published for the Fourteenth Session of the International Statistical Institute, and is consequently somewhat incomplete. It is hoped to eliminate these defects in a later edition.]

Catholic Studies in Social Reform. A Series of Manuals edited by the Catholic Social Guild. VI. Christian Citizenship, by the Rev. Thomas Wright. 80 pp.

—— VII. The Drink Question, by the Rev. Joseph Keating. 105 pp., 8vo. London: P. S. King and Son, 1914. Price 6*d*. each net.

[These manuals have been prepared for the use of Catholics interested in social questions, and both of them give a clear outline of the subjects with which they respectively deal, in the light of catholic principles.]

Eugenics: Twelve University Lectures by M. A. Aldrich, W. H. Carruth, C. B. Davenport, C. A. Ellwood, A. Holmes, W. H. Howell, H. E. Jordan, A. G. Keller, E. L. Thorndike, V. C. Vaughan, H. J. Webber, R. H. Wolcott. With a Foreword by Lewellys F. Barker. xiii + 348 pp., 8vo. New York: Dodd, Mead and Co., 1914. Price $2 net.

[A selection from a number of lectures given in various universities in the United States for the purpose of extending the knowledge of Eugenics. There is a certain amount of repetition, unavoidable in the preparation of a work of this nature, though efforts have been made to minimise it.]

Port of London Authority. London: The Port of the Empire. Ob. 8vo. 1914.

CURRENT NOTES.

The trade returns for the past month are not altogether satisfactory, although the increase shown in the imports for raw materials for textile manufactures encourages the hope of renewed activity. The subjoined figures compare the twelve months ending June, 1914, with the twelve months ending June, 1913 :—

[000's omitted.]

Imports.	Twelve months ending June, 1914.	Twelve months ending June, 1913.	Increase (+) or Decrease (−).
Imports, value c.i.f.—	£	£	£
I. Food, drink and tobacco	289,912,	288,125,	+ 1,787,
II. Raw materials and articles mainly unmanufactured	277,470,	284,330,	− 6,860,
III. Articles wholly or mainly manufactured	195,228,	193,970,	+ 1,258,
IV. Miscellaneous and unclassified (including parcel post)	3,261,	3,062,	+ 199,
Total merchandise	765,871,	769,487,	− 3,616,
Imports of bullion and specie	75,479,	70,794,	+ 4,685,

[000's omitted.]

Exports.	Twelve months ending June, 1914.	Twelve months ending June, 1913.	Increase (+) or Decrease (−).
Exports of produce and manufactures of the United Kingdom, value f.o.b.—	£	£	£
I. Food, drink and tobacco	33,505,	31,810,	+ 1,695,
II. Raw materials and articles wholly unmanufactured	70,127,	67,979,	+ 2,148,
III. Articles wholly or mainly manufactured	408,115,	409,046,	− 931,
IV. Miscellaneous and unclassified (including parcel post)	11,900,	10,130,	+ 1,770,
Exports of foreign and colonial merchandise, value f.o.b.—			
I. Food, drink and tobacco	16,726,	15,722,	+ 1,004,
II. Raw materials and articles mainly unmanufactured	64,531,	67,093,	− 2,562,
III. Articles wholly or mainly manufactured	28,401,	29,982,	− 1,581,
IV. Miscellaneous and unclassified (including parcel post)	138,	202,	− 64,
Total, British, foreign and colonial	633,443,	631,964,	+ 1,479,
Exports of bullion and specie	66,392,	64,144,	+ 2,248,

[000's omitted.]

Shipping.	Twelve months ending June, 1914.	Twelve months ending June, 1913.	Increase (+).
	Tons.	Tons.	Tons.
Total, British and foreign, *entered* with cargoes	49,459,	48,206,	+ 1,253,
Total, British and foreign, *cleared* with cargoes	68,180,	67,396,	+ 784,

Mr. Sauerbeck's index-number of prices for June, as given in the *Statist*, is 81·2, as against 82·3[1] in May. The downward movement of prices has made further progress in June. The fall in June has been mainly in materials, although foodstuffs have again declined. The heaviest decline has been in textiles, due to the heavy fall in the price of jute. Vegetable foods have again fallen, but are not as low as in December. Animal food has declined in consequence of the price of pork. There has been a general drop in prices of minerals, more especially in copper and tin. The index-number of foodstuffs works out at 74·8, as against 75·9 in May, and for materials at 85·7, against 86·9 (corrected figure) last month. The *Economist* index-number stands at 2,549, as compared with 2,595 in May.

According to the Board of Trade *Labour Gazette* the state of the labour market last May was as follows :—

	Trade Unions making returns. Net membership.	Reported as unemployed.	
		Number.	Percentage.
May, 1914	993,131	22,681	2·3
April, 1914	991,874	20,924	2·1
May, 1913	910,692	17,138	1·9

Employment in May was, on the whole, good. There was no further decline in the pig iron and iron and steel trades, but in shipbuilding employment, although still good, showed some falling off. There was also a seasonal decline in coal mining. The engineering and tinplate trades continued to be well employed. The textile trades showed a slight recovery, and there was a further seasonal improvement in the building and kindred trades, except in London, which was still affected by the dispute. It was reported by the Labour Exchanges that there was a continuance of the demand for labour in the shipbuilding trades on the Clyde and the North-East Coast. In the building trades there was a scarcity of labour in some districts, and painters continued to be in demand in the provinces. There was also a deficiency of women in the clothing trades. Compared with a year ago employment showed a decline in the principal trades. The coal mining, engineering, shipbuilding and textile trades were not so fully employed, and there was a marked decline in pig iron and iron and steel. On the other hand there was an improvement in the tinplate, boot and shoe, glass and brick trades.

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[1] Last month the *Statist* gave the index-number as 82·6; the correct figure was 82·3, an error having occurred in compilation.

A Paper entitled "Industrial Recruiting and the Displacement " of Labour," read by Professor Chapman and Mr. Arnold Shimmin before the Manchester Statistical Society, in March, has been reprinted in pamphlet form. The authors' fundamental idea was to investigate the census returns relating to occupations with a view to discovering what, if any, inevitable overflows of labour took place from this and that industry, under present conditions, and what, if any, unavoidable surplus inflows took place, at points removed from the usual locations of entry and discharge. The authors point out that generalisation is difficult in view (*a*) of differences in the normal age-distribution of labour in different industries involving differences in positive or negative accelerations, (*b*) of the fact that the effects of growth or contraction must go on for years modifying age-distribution and with it accelerations, and (*c*) of the fact that growths and contractions in other industries affect the age-distribution of the labour supply available for any given industry. The following conclusions, however, are put forward, viz.: (1) Expansion of an industry is obtained mainly by the stoppage of overflows of labour, when that is possible, and by an increase of young people. (2) Contraction of an industry is obtained mainly by the stoppage of normal inflows of labour, when that is possible, and by displacements at the upper and lower ends of the age-scale. In order to get some idea of the effect of the abnormal expansion or contraction of an industry on its abnormal acceleration positive or negative, the authors applied the method of correlation, with the result (decimals being ignored) that the coefficient of correlation is + ·2, and the probable error ·12, the ratio between them being 1·7. Hence the conclusion appears to follow that the dependence is very slight if there is any dependence at all. But from a minute examination which the authors made of changes in age-distribution in four leading industries during changes in their size, the inference seemed certain that the influences of the latter on the former were considerable. A simple explanation of the discrepancy is given. The influences are considerable, but they are twofold and happen to conflict. Industrial expansion checks overflows, thereby tending to lower acceleration as a rule, though increasing the proportion of the middle and higher age-groups, since the higher an age-group the greater is the proportion of its membership lost to industry at home before the next decade. But, as soon as may be, industrial expansion causes an increased attraction of new blood, and this tends to raise acceleration. If the coefficient of correlation given above may be taken as normal, the two influences about balance at first. What tends to happen ultimately can be discovered by correlating abnormal industrial expansions and contractions with accelerations after ten years. When this is done a *positive* correlation coefficient is reached of ·4, against a probable error of ·147, the ratio being 2·7. If any conclusion is possible, it is what would be expected, namely, that in course of time the influences accentuating acceleration incline to predominate.

The final Report has been issued of the Royal Commission on Indian Finance and Currency. (Cd–7236. *9d.*) Among the conclusions arrived at by the Commissioners are the following :—(i) The establishment of the exchange value of the rupee on a stable basis has been and is of the first importance to India. (ii) The measures adopted for the maintenance of the exchange value of the rupee have been necessarily and rightly rather supplementary to, than in all respects directly in pursuance of, the recommendations of the Committee of 1898. (iii) These measures worked well in the crisis of 1907-08, the only occasion on which they have been severely tested hitherto. (iv) The time has now arrived for a reconsideration of the ultimate goal of the Indian currency system. The belief of the Committee of 1898 was that a gold currency in active circulation is an essential condition of the maintenance of the gold standard in India, but the history of the last fifteen years shows that the gold standard has been firmly secured without this condition. (v) It would not be to India's advantage to encourage an increased use of gold in the internal circulation. (vi) The people of India neither desire nor need any considerable amount of gold for circulation as currency, and the currency most generally suitable for the internal needs of India consists of rupees and notes (vii) A mint for the coinage of gold is not needed for purposes of currency or exchange, but if Indian sentiment genuinely demands it, and the Government of India are prepared to incur the expense, there is no objection in principle to its establishment either from the Indian or the Imperial standpoint: provided that the coin minted is the sovereign or the half-sovereign, and it is pre-eminently a question in which Indian sentiment should prevail. (viii) If a mint for the coinage of gold is not established, refined gold should be received at the Bombay Mint in exchange for currency. (ix) The Government should continue to aim at giving the people the form of currency they demand, whether rupees, notes or gold, but the use of notes should be encouraged. (x) The essential point is that this internal currency should be supported for exchange purposes by a thoroughly adequate reserve of gold. (xi) No limit can at present be fixed to the amount up to which the gold standard reserve should be accumulated. (xii) A much larger proportion of the reserve should be held in actual gold. By an exchange of assets between this reserve and the paper currency reserve a total of about 10,000,000*l.* in gold can be at once secured. This total should be raised as opportunity offers to 15,000,000*l.*, and thereafter the authorities should aim at keeping one-half of the total reserve in actual gold. (xiii) The Indian branch of the gold standard reserve in which rupees are now held, should be abolished, the rupees being handed over to the paper currency reserve in exchange for gold. (xiv) The proper place for the location of the whole of the gold standard reserve is London. (xv) The Government should definitely undertake to sell bills in India on London at the rate of 1*s.* $3\frac{29}{32}$*d.* per rupee whenever called upon to do so. (xvi) The paper currency system of India should be made more elastic. (xvii) A change in the date of the commencement of the financial year from April 1 to November 1 or January 1, is recommended, as probably enabling the Government of India to frame more accurate Budgets. Such a change would also enable the India Office to fix the amount of their borrowings in London with closer regard to immediate needs. (xviii) The system of placing portions of the India Office balance out on short loan with approved borrowers in the City of London is, on the whole, well managed: but attention is directed to (*a*) the term for which loans are made; (*b*) the desirability of giving greater publicity to the methods by which admission is gained to the list of approved borrowers; (*c*) some defects in the list of approved securities, and especially its narrow range. (xix) There is no ground for the suggestion that the City members of the Secretary of State's Council showed any kind of favouritism in placing on deposit with certain banks, with the directorates of which they were connected, a part of the India Office balance at a time when it was too large to be placed entirely with the approved borrowers. But attention is directed to the desirability of avoiding as far as possible all occasion for such criticism, though it may be founded on prejudice and ignorance of the facts. (xx) The continuance is recommended of a Finance

Committee of Council, as providing the machinery most suitable for the work required. (xxi) The Finance Committee should, if possible, contain three members with financial experience, representing (*a*) Indian official finance; (*b*) Indian banking and commerce; (*c*) the London money market. In any case there should be at least one member with Indian financial experience. The absence of any representative of Indian finance on the Committee since 1911 has resulted in giving undue prominence to the representation of London City experience.

It is announced that the eighth Italian Geographical Congress will be held at Bari, in September, 1914, and will comprise an exhibition of charts, &c., under the following sections, viz.: (*a*) Agriculture; (*b*) Industry; (*c*) Traffic; (*d*) Atlases, etc., illustrating the general distribution of population; (*e*) Treatises on economic cartography. Further information in regard to the proposed arrangements may be obtained from Professor Carlo Maranelli, Royal High School of Commerce, Bari, Italy.

Now that a pause has come in the expansion of trade which was so marked a feature of the last few years, it will be of interest to survey the course of expansion and contraction of imports and exports revealed by the published monthly figures for a decade. The usual monthly comparison (see p. 894) is therefore supplemented in this issue by a series of tables in which not only the aggregate monthly figures, but the separate figures for the three main classes of merchandise imported and exported—namely, food, raw materials and manufactures—are given for each month since the beginning of 1904. An examination of these tables will show the ebb and flow of trade with the seasons, and the variations in those seasons themselves. The fact that the JOURNAL is not published in the months of August to November renders the series of regular tables incomplete. It is found that in some of the tables published in the earlier issues of the current volume certain errors have unfortunately occurred involving the presentation of incorrect totals. For purposes of reference, the figures given in the tables now presented should therefore be substituted for those previously published. The present tables also supply the omissions due to the fact that the JOURNAL appears in eight months only of the twelve.

IMPORTS.

Imports.—Class I.

000 £'s.

	1904.	1905.	1906.	1907.	1908.
January	18,107,	18,728,	19,704,	19,746,	19,948,
February	17,270,	16,382,	16,571,	16,339,	18,716,
March	20,441,	19,941,	19,557,	19,671,	22,050,
April	18,307,	17,563,	17,814,	19,631,	19,673,
May	18,321,	19,019,	20,344,	20,355,	18,248,
June	18,776,	17,862,	21,190,	20,603,	19,776,
July	18,060,	19,332,	20,848,	21,562,	20,160,
August	18,937,	20,612,	21,385,	21,772,	18,365,
September	19,176,	20,675,	19,923,	20,259,	22,385,
October	21,967,	20,606,	21,761,	24,455,	22,135,
November	21,527,	20,653,	20,157,	22,390,	21,443,
December	20,332,	20,340,	19,222,	20,738,	21,605,
Corrected total for year	230,645,	231,300,	238,158,	247,291,	244,134,

Imports. Class II. Raw materials

	1904.	1905.	1906.	1907.	1908.
January	17,708,	17,620,	20,399,	26,863,	24,969,
February	16,074,	15,138,	18,152,	23,993,	20,999,
March	15,146,	15,593,	19,306,	23,766,	16,737,
April	14,891,	14,241,	16,483,	23,062,	14,637,
May	14,561,	14,856,	16,727,	18,780,	14,195,
June	12,797,	14,950,	13,965,	15,337,	14,699,
July	11,969,	13,603,	14,676,	16,858,	14,383,
August	11,965,	13,891,	14,009,	14,709,	12,868,
September	12,285,	12,870,	13,121,	13,187,	13,226,
October	16,081,	15,600,	19,120,	19,650,	16,406,
November	17,222,	19,587,	22,276,	21,899,	17,159,
December	21,011,	20,121,	22,990,	23,146,	23,210,
Corrected total for year	181,886,	187,918,	211,103,	241,249,	203,455,

Imports. Class III. Articles

	1904.	1905.	1906.	1907.	1908.
January	10,112,	11,236,	13,118,	13,674,	11,274,
February	10,586,	11,113,	12,592,	12,370,	12,467,
March	12,873,	13,212,	14,192,	14,127,	13,153,
April	11,801,	11,260,	12,569,	13,901,	12,624,
May	11,732,	12,788,	14,133,	13,293,	11,655,
June	11,463,	10,585,	12,552,	11,670,	11,487,
July	10,756,	11,601,	12,881,	13,589,	12,010,
August	11,343,	12,161,	13,265,	12,622,	11,336,
September	11,418,	11,979,	11,860,	11,693,	12,209,
October	11,310,	12,327,	13,539,	13,378,	12,014,
November	11,227,	12,677,	13,109,	12,662,	11,103,
December	11,335,	12,492,	12,373,	11,931,	11,792,
Corrected total for year	136,298,	143,585,	156,185,	154,904,	143,086,

IMPORTS.

Food, drink, and tobacco.

000 £'s.

1909.	1910.	1911.	1912.	1913.	1914.
19,161,	21,599,	20,615,	24,180,	22,144,	23,747,
17,240,	18,388,	17,952,	20,003,	20,720,	20,930,
21,219,	22,278,	20,060,	20,692,	21,981,	23,848,
21,721,	21,210,	19,163,	21,461,	23,741,	22,349,
17,524,	21,567,	20,711,	21,024,	23,278,	21,950,
22,606,	21,783,	21,200,	21,231,	24,362,	23,018,
22,032,	20,000,	22,214,	24,679,	26,358,	—
21,939,	21,460,	22,674,	21,885,	23,565,	—
22,738,	21,575,	22,911,	23,266,	25,063,	—
21,364,	22,197,	24,727,	28,004,	27,362,	—
23,602,	22,702,	26,613,	25,719,	25,740,	—
23,407,	23,321,	25,097,	25,956,	26,455,	—
254,319,	257,682,	263,958,	280,588,	290,202,	—

and articles mainly unmanufactured.

1909.	1910.	1911.	1912.	1913.	1914.
23,061,	21,708,	28,751,	27,413,	32,222,	28,079,
21,628,	20,156,	24,820,	21,945,	27,181,	24,548,
17,690,	21,774,	23,090,	24,271,	22,129,	24,854,
15,787,	25,195,	18,720,	21,173,	22,008,	22,460,
15,222,	19,981,	18,254,	18,805,	21,400,	20,335,
15,853,	19,727,	16,443,	15,465,	18,494,	19,107,
15,510,	17,197,	15,078,	17,697,	18,633,	—
14,016,	16,885,	11,669,	18,192,	16,760,	—
13,816,	16,643,	16,725,	18,136,	19,920,	—
18,674,	22,371,	21,708,	25,269,	27,012,	—
24,651,	27,718,	24,423,	29,096,	27,335,	—
24,245,	31,883,	25,481,	31,950,	28,499,	—
220,145,	261,176,	248,159,	275,668,	281,822,	—

wholly or mainly manufactured.

1909.	1910.	1911.	1912.	1913.	1914.
11,014,	12,375,	13,066,	15,108,	16,565,	15,685,
11,400,	12,339,	13,089,	11,494,	15,600,	16,300,
12,946,	13,891,	15,198,	15,983,	16,709,	18,011,
11,491,	12,975,	13,199,	11,553,	16,975,	16,592,
11,925,	13,477,	14,769,	15,002,	16,364,	16,579,
13,044,	12,920,	13,233,	13,774,	15,203,	15,876,
12,500,	11,973,	13,530,	15,687,	16,555,	—
12,237,	13,408,	13,008,	16,386,	15,462,	—
12,687,	13,129,	13,847,	15,269,	16,131,	—
12,416,	13,252,	14,061,	17,418,	17,050,	—
13,152,	13,466,	14,153,	15,901,	15,145,	
12,871,	13,651,	11,124,	15,896,	15,814,	
147,671,	156,845,	165,557,	185,467,	193,602,	—

RE-EXPORTS.

Re-exports.—Class I.

000 £'s.

	1904.	1905.	1906.	1907.	1908.
January	801,	830,	1,017,	1,006,	752,
February	859,	915,	974,	1,007,	824,
March	908,	996,	1,146,	1,060,	874,
April	851,	903,	926,	941,	797,
May	883,	1,147,	1,066,	1,090,	1,017,
June	776,	898,	873,	1,031,	754,
July	859,	867,	882,	1,085,	1,072,
August	862,	956,	958,	965,	807,
September	979,	1,042,	948,	955,	922,
October	1,103,	1,219,	1,170,	1,175,	1,076,
November	1,073,	1,245,	1,078,	990,	1,017,
December	926.	1,012,	1,010,	864,	966,
Corrected total for year	10,881,	12,027,	12,049,	12,169,	10,879,

Re-exports.—Class II. Raw materials

January	3,298,	3,545,	3,863,	5,253,	3,893,
February	4,756,	4,779,	4,882,	5,911,	4,627,
March	3,460,	3,945,	3,947,	4,561,	3,229,
April	4,067,	3,945,	4,455,	6 455,	4,218,
May	3,082,	3,889,	3,856,	4,922,	3,375,
June	3,267,	3,768,	4,167,	3,915,	3,468,
July	2,664,	3,000,	3,156,	3,900,	3,187,
August	2,848,	3,478,	3,601,	3,933,	4,108,
September	2,181,	2,539,	2,653,	2,875,	2,527,
October	2,975,	3,415,	3,765,	3,718,	4,099,
November	2,901,	3,445,	3,849,	3,140,	3,537,
December	3,731,	4,039,	4,720,	3,996,	5,050,
Corrected total for year	38,768,	43,411,	46,921,	52,578,	45,310,

Re-exports.—Class III. Articles

January	1,610,	1,734,	2,553,	2,521,	1,936,
February	1,787,	1,918,	2,132,	2,498,	2,040,
March	1,573,	1,867,	2,173,	2,482,	1,853,
April	1,828,	1,413,	1,908,	2,265,	1,753,
May	1,610,	1,762,	2,182,	2,430,	2,035,
June	1,610,	1,722,	2,208,	2,145,	1,801,
July	1,756,	1,883,	1,997,	2,372,	2,024,
August	1,652,	1,973,	2,344,	2,423,	1,877,
September	1,603,	1,929,	1,895,	2,097,	1,814,
October	1,565,	1,595,	2,194,	1,964,	1,890,
November	1,732,	1,990,	2,357,	1,985,	2,110,
December	1,762,	2,029,	2,003,	1,852,	2,158,
Corrected total for year	20,537,	22,208,	25,942,	27,007,	23,255,

RE-EXPORTS.

Food, drink, and tobacco.

000 £'s.

1909.	1910.	1911.	1912.	1913.	1914.
907,	893,	1,133,	1,254,	1,401,	1,437,
920,	919,	1,003,	1,145,	1,180,	1,324,
1,120,	978,	1,158,	1,479,	1,266,	1,439,
1,106,	1,196.	977,	1,276,	1,306,	1,406,
962,	1,005,	1,589,	1,302,	1,395,	1,607,
958,	1,094,	1,174,	786,	1,321,	1,441,
993,	982,	997,	1,062,	1,211,	—
858,	1,011,	856,	1,188,	1,199,	—
971,	1,124,	1,219,	1,209,	1,182,	—
1,101,	1,288,	1,469,	1,545,	1,592,	—
1,037,	1,215,	1,526,	1,611,	1,476,	—
1,066,	1,174,	1,210,	1,238,	1,411,	—
12,000,	12,874,	14,311,	15,094,	15,943,	—

and articles mainly unmanufactured.

3,682,	4,948,	5,104,	5,500,	6,296,	5,588,
5,334,	6,974,	6,450,	7,150,	7,016,	6,340,
4,364,	5,349,	5,368,	6,624,	5,998,	5,732,
5,676,	8,421,	6,395,	6,497,	6,399,	7,305,
4,276,	5,299,	5,057,	7,040,	5,599,	6,360,
4,896,	4,553,	5,526,	3,395,	4,705,	5,182,
4,098,	4,725,	4,236,	3,895,	4,477,	—
4,152,	4,809,	3,731,	6,072,	4,592,	—
3,376,	3,382,	4,051,	4,658,	3,123,	—
4,546,	4,464,	4,831,	5,768,	5,541,	—
3,753,	4,074,	4,074,	5,219,	4,363,	—
6,244,	6,311,	5,082,	5,571,	5,947,	—
54,398,	63,310,	59,958,	67,286,	64,038,	—

wholly or mainly manufactured.

2,088,	2,277,	2,399,	2,834,	2,998,	2,557,
2,215,	2,279,	2,525,	2,421,	2,516,	2,560,
2,038,	2,104,	2,616,	2,754,	2,365,	2,360,
1,834,	2,234,	2,112,	2,295,	2,341,	2,077,
1,997,	1,978,	2,184,	2,474,	2,373,	2,402,
2,101,	2,726,	2,044,	1,556,	2,507,	2,117,
2,237,	2,483,	2,927,	2,122,	2,616,	—
1,934,	2,244,	2,023,	2,672,	2,347,	—
2,091,	2,260,	2,531,	2,138,	2,507,	—
1,919,	2,225,	2,356,	2,701,	2,412,	—
1,929,	2,162,	2,228,	2,789,	2,146,	—
2,313,	2,383,	2,380,	2,428,	2,363,	—
24,673,	27,342,	28,345,	29,189,	29,458,	—

EXPORTS (UNITED KINGDOM PRODUCE).

Exports (United Kingdom Produce).—Class I.

000 £'s.

	1904.	1905.	1906.	1907.	1908.
January	1,173,	1,276,	1,510,	1,494,	1,497,
February	1,046,	1,142,	1,312,	1,389,	1,441,
March	1,212,	1,350,	1,471,	1 413,	1,464,
April	1,130,	1,195,	1,315,	1,475,	1,448,
May	1,128,	1,404,	1,570,	1,607,	1,609,
June	1,149,	1,368,	1,537,	1,734,	1,573,
July	1,439,	1,670,	1,882,	2,298,	2,034,
August	1,717,	1,928,	1,961,	2,340,	2,113,
September	1,817,	2,127,	2,139,	2,327,	2,026,
October	1,765,	2,089,	2,381,	2,390,	2,253,
November	1,832,	2,192,	2,322,	2,418,	2,277,
December	1,457,	1,659,	1,726,	1,863,	1,978,
Corrected total for year	16,622,	19,068,	20,564,	22,357,	21,708,

Exports (United Kingdom Produce).—Class II.

January	2,728,	2,809,	3,263,	3,881,	4,275,
February	2,689,	2,836,	3,095,	3,906,	4,213,
March	3,188,	2,967,	3,638,	4,134,	4,251,
April	2,995,	2,753,	3,315,	4,345,	4,232,
May	3,159,	3,272,	4,030,	4,636,	4,760,
June	3,141,	2,876,	3,253,	4,509,	4,118,
July	2,938,	3,087,	3,899,	5,096,	4,802,
August ...	2,873,	3,113,	3,774,	4,860,	4,333,
September	3,072,	3,137,	3,639,	4,852,	4,400,
October	3,069,	3,288,	4,095,	5,274,	4,817,
November	3,192,	3,126,	3,710,	5,019,	4,220,
December	3,177,	3,059,	3,531,	4,492,	4,341,
Corrected total for year	36,488,	36,737,	43,838,	55,589,	52,756,

Exports (United Kingdom Produce).—Class III.

January	19,850,	20,551,	25,600,	29,151,	28,114,
February . ..	19,892,	20,955,	24,016,	26,363,	25,835,
March	19,521,	23,370,	26,088,	28,714,	26 784,
April	19,111,	19,836,	21,918,	28,101,	24,502,
May	19,678,	22,153,	25,634,	30,178,	24,215,
June	19,463,	21,416,	25,458,	26,404,	22,828,
July	20,014,	22,682,	27,113,	32,530,	26,392,
August	21,376,	24,047,	27,294,	29,501,	23,313,
September	20,659,	23,642,	24,282,	27,510,	24,707,
October	20,227,	23,507,	26,293,	30,063,	25,327,
November	20,650,	23,788,	26,346,	27,813,	22,159,
December . ..	22,982,	23,320,	25,567,	25,846,	22,511,
Corrected total for year	213,079,	268,648,	301,958,	341,440,	296,582,

EXPORTS (UNITED KINGDOM PRODUCE).

Food, drink, and tobacco.

000 £'s.

1909.	1910.	1911.	1912.	1913.	1914.
1,447,	1,625,	2,026,	2,303,	2,274,	2,409,
1,516,	1,674,	1,940,	2,132,	2,093.	2,339,
1,731,	1,739,	2,151,	2,701,	2,117.	2,426,
1,610.	1,931,	1,786,	2,522,	2.290.	2,304,
1,693,	1,776,	2,096,	2,432,	2,306,	2,333,
1,813,	2,118,	2,107,	2,278,	2,413,	2,600,
2,190,	2,538,	2,236,	2,766,	2,763,	—
2,089,	2,465,	2,171,	3,011,	2,835.	—
2,303,	2,500,	2,991,	2,998,	3,189,	—
2,355,	2,705,	3,559,	3,559,	3,275,	—
2,552,	2,838,	3,354,	3,537,	3,943,	—
2,055,	2,206,	2,615,	2,480.	3,110,	—
23,336,	26,071,	29,038,	32,686,	32,588,	—

Raw materials and articles mainly unmanufactured.

1909.	1910.	1911.	1912.	1913.	1914.
3,716,	3,982,	4,380,	4,896,	5,809,	6,002,
3,654,	3,879,	4,121,	4,901,	5.222,	5,673,
4,208,	4,379,	4,601,	2,673,	5,314,	5,857,
3,970,	4,656,	4,076,	2,403,	6,079,	5,268,
4,483,	4,523,	4,947,	5,793,	5.753,	5,944,
4,188,	4,775,	4,206,	4,707,	5,760,	5,414.
4,490,	4,418,	3,944,	5,810,	6,100,	—
4,144,	4,484,	4,190,	5,637,	5.367,	—
4,454,	4,662,	4,680,	5,467,	5,767,	—
4,665,	4,628,	4,857,	6,103,	6,447,	—
4,611,	4,432,	4,811,	5,663,	5,859,	—
4,589,	4,518,	4,917,	5,374,	6,120,	—
51,156,	53,328,	53,726,	59,417,	69,905,	—

Articles wholly or mainly manufactured.

1909.	1910.	1911.	1912.	1913.	1914.
22,917,	28,609,	30,665,	32,407,	36,600,	38,564,
22,392,	25,668,	29,030.	29,864,	32,141,	32,451,
25,409,	27,729,	33,458,	34,459,	33,368,	35,332,
22,955,	28,054,	29,143,	27,220,	33,934,	31,503,
22,844,	26,628,	29,751,	29,628,	35,019,	32,869,
23,197,	27,334,	29,111,	27,300,	33,831,	30,926,
28,187,	30,775,	27,700,	32,760,	36,971,	—
25,415,	31,163,	29,058,	34,367,	35,129,	—
25,471,	29,011,	28,499,	33,906,	32,430,	—
26,248,	29,516,	34,250,	37,777,	35,911,	—
25,486,	28,725,	31,835,	33,206,	33,943,	—
26,394,	29,812,	29,887,	32,326,	32,292,	—
296,758,	342,869,	362,223,	385,028,	411,368,	—

Total Imports—

000 £'s.

	1904.	1905.	1906.	1907.	1908.
January	46,133,	47,756,	53,474,	60,535,	56,363,
February	44,111,	42,824,	47,527,	52,927,	52,428,
March	48,692,	48,959,	53,262,	57,741,	52,115,
April	45,182,	43,282,	47,059,	56,783,	47,095,
May	44,780,	46,839,	51,418,	52,616,	44,258,
June	43,197,	43,555,	47,882,	47,806,	46,135,
July	40,957,	44,742,	48,608,	52,208,	46,769,
August	42,440,	46,857,	48,889,	49,290,	42,740,
September	43,074,	45,727,	45,060,	45,335,	48,015,
October	49,518,	48,672,	54,637,	57,660,	50,746,
November	50,671,	53,136,	55,747,	57,146,	49,904,
December	52,845,	53,119,	54,672,	55,992,	56,826,
Corrected total for year	551,039,	565,020,	607,889,	645,808,	592,953,

Total Re-exports—

January	5,712,	6,114,	7,416,	8,793,	6,599,
February	7,405,	7,620,	7,996,	9,426,	7,498,
March	5,947,	6,812,	7,276,	8,110,	5,965,
April	6,754,	6,304,	7,332,	9,670,	6,773,
May	5,586,	6,805,	7,117,	8,452,	6,432,
June	5,659,	6,399,	7,252,	7,098,	6,029,
July	5,294,	5,773,	6,059,	7,388,	6,311,
August	5,378,	6,428,	6,924,	7,367,	6,820,
September	4,772,	5,521,	5,521,	5,942,	5,288,
October	5,661,	6,236,	7,112,	6,873,	7,082,
November	5,713,	6,693,	7,293,	6,132,	6,682,
December	6,410,	7,093,	7,746,	6,720,	8,187,
Corrected total for year	70,304,	77,780,	85,102,	91,942,	79,624,

Total Exports (United Kingdom

January	24,083,	24,990,	30,775,	35,071,	34,408,
February	23,895,	25,269,	28,771,	32,073,	31,950,
March	24,252,	28,071,	31,651,	34,723,	32,911,
April	23,485,	24,138,	27,032,	34,417,	30,705,
May	24,332,	27,253,	31,725,	36,923,	31,067,
June	27,070,	25,985,	30,639,	33,111,	28,953,
July	24,784,	27,821,	33,143,	40,452,	33,706,
August	26,360,	29,518,	33,493,	37,355,	30,343,
September	25,929,	29,350,	30,525,	35,156,	31,621,
October	25,414,	29,368,	33,234,	38,320,	33,008,
November	26,113,	29,608,	32,975,	35,862,	29,147,
December	28,072,	28,652,	31,409,	32,742,	29,402,
Corrected total for year	300,711,	329,817,	375,575,	426,035,	377,104,

(including miscellaneous).

000 £'s.

1909	1910.	1911.	1912.	1913.	1914.
53,500,	55,910,	62,693,	66,965,	71,242,	68,017,
50,468,	51.151,	56,071.	59,715.	63,787,	62,051,
52,013,	58.109,	58,538,	61,167,	61,342,	66,935,
49,174,	59,556,	51,851,	60,405,	62.956,	61,625.
44,855,	55.230,	53,932,	55,066,	61,278,	59,103,
51,712.	54,630,	51,103.	50,668,	58,323,	58,272,
50,316,	49,374,	51,038,	58,299,	61,787,	—
48,411,	52,019,	50,549,	59,695,	56,012,	—
49,476,	51,547,	53,680.	57,179,	61,359,	—
52,641,	58,011,	60,705,	71,023,	71,733,	—
61,612,	64,090,	65,394,	70,987.	68,473,	—
60,781,	69,109,	64,938,	74,063,	71,112,	—
624,705,	678.257,	680,158,	744,641,	758,735,	—

(including miscellaneous).

6,688,	8,147,	8,641,	9,595,	10,706,	9,597,
8,474,	10,185,	9.991,	10,725,	10,746,	10,229,
7,540,	8,444,	9,175,	10,867,	9,633,	9,536,
8,631,	11.859,	9,489.	10,084,	10,059,	10,789,
7,251,	8,294,	8,835,	10,825,	9.370,	10.372,
7,966,	8,384,	8,753.	5.739,	8,541.	8,753.
7,374,	8,222,	8,179,	7,094.	8.311.	—
6,990.	8,099,	6.649.	9.958,	8,150,	—
6,464,	6,808,	7.818,	8.035,	6,853,	—
7,601,	8,000,	8.673,	10,045,	9,556,	—
6,752,	7,459,	7,834,	9.631,	8,001,	—
9,635,	9,877,	8.680,	9.242,	9,729,	—
91,345,	103,761.	102,759,	111.738,	109,575,	—

Produce)—(including miscellaneous).

28,803,	34,803,	37,731,	40,417,	45,416,	47,806.
28,024,	31,692,	35,653.	37,490,	40,173,	41,262,
31,905,	34,392.	40,864,	40,714,	41,690,	44,519,
28,958,	35,292,	35,692.	32,887,	43,053,	39,947,
29,526,	33,607,	37,615,	38,832,	43,858,	42,051,
29,718,	34,800,	36,113,	34,972,	42,837,	39,873,
35,487,	38.388,	34,608,	41,986,	47,164,	—
32,115,	38,639,	36,083,	43,779,	44,111,	—
32,804,	36,964,	36,819.	43,204,	42,425,	—
33,931,	37,691,	43,546,	48.334,	46,623,	—
33,321,	36,897,	40,986,	43,358,	44,756,	—
33,790,	37,424,	38,572,	41,459,	43,327,	—
378,180,	430,385,	454,119,	487,223,	525,245,	—

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Journal de la Société de Statistique de Paris. *June*, 1914—Les émissions et remboursements d'obligations des six grandes compagnies de chemins de fer en 1913 : *Neymarck* (*A.*). La circulation de la monnaie en France : *Roulleau* (*G.*).

La Réforme Sociale. *June* 1, 1914—L'enseignement professionnel des masses agricoles : *Doin* (*Paul*). L'enfance malheureuse en France. L'enfance abandonnée : *Witt-Guizot* (*François de*). Le malaise capitaliste. Les cours et le placement des valeurs mobilières : (*Parisy M.*).

Revue des Sciences Politiques. *June*, 1914—Le Home Rule et l'Ulster : *Hamelle* (*Paul*). De Berlin à Bagdad : *Patris* (*B. Combes de*). L'autonomie des ports de commerce : *Pinot* (*Pierre*). Le régime des mines : *Tartière* (*Maurice*). Chronique Legislative (1913) : *Lavergne* (*A. de*).

GERMANY—

Archiv für Rassen- und Gesellschafts-Biologie. *Heft* 6, 1914—Was kosten die minderwertigen Elemente dem Staat und der Gesellschaft : *Kaup* (*Dr. J.*).

Archiv für Sozialwissenschaft und Sozialpolitik. *May*, 1914—Objekt und Grundbegriffe der theoretischen Nationalökonomie : *Sombart* (*Werner*). Die englische Agrarreform : *Levy* (*Prof. Hermann*). Kopernikus' Münz- und Geldtheorie : *Jastrow* (*Prof. J.*). Zur Rechtslage der Kollektivverträge : *Kulemann* (*W.*). Die ökonomische und sozialpolitische Bedeutung des Taylorsystems : *Lederer* (*Dr. E.*). Die Heimarbeit in Frankreich und ihre gesetzliche Regelung : *Louis* (*Paul*). Die soziale Funktion der Teuerung : *Eggenschwyler* (*W.*). Politik und Oekonomie im Briefwechsel Marx-Engels : *Bernstein* (*Ed.*) Die Gewerkschaftsbewegung in Oesterreich, die Kämpfe zwischen Unternehmern und Arbeitern und die sozialpolitische Gesetzgebung im Jahre 1913-14.

GERMANY—*Contd.*

Jahrbücher für Nationalökonomie und Statistik. *June*, 1914—Wirtschaft und Technik: *Liefmann* (*Robert*). Geschichte, Inhalt und Kritik der österreichischen Gewerbenovelle vom Jahre 1907: *Heller* (*Emil*). Die Entwicklung des Preisniveaus und des Getreidebedarfs in Deutschland und England in den letzten Dezennien. Zur Statistik des Geburtenrückganges: *Feld* (*Wilhelm*).

Zeitschrift für die gesamte Versicherungs-Wissenschaft. *July*, 1914—Zur Frage der Belastung der deutschen Industrie durch die Arbeiterversicherung: *Branchart* (*M.*).

ITALY—

Giornale degli Economisti e Rivista di Statistica. *June*, 1914—Sulla teoria economica delle crisi: *Vecchio* (*Gustavo Del*). La colonizzazione e l'organizzazione agraria in Siberia: *Griziotti-Kretzchmann* (*Jenny*). Sulla ripartizione territoriale della ricchezza privata in Italia: *Contento* (*Aldo*).

Rivista Italiana di Sociologia. *March–April*, 1914—Ragioni storiche e recenti tendenze della politica commerciale: *Luzzatto* (*G.*). Nuove osservazioni sui problemi dell' eugenica: *Gini* (*C.*). La filosofia del diritto come scienza autonoma: *Solari* (*G.*). La storia e l'educazione morale: *Resta* (*R.*).

SWEDEN—

Ekonomisk Tidskrift. *Haft* 6.—Stats- och kommunlån och deras amortering: *Flodström* (*I.*). Kan ett land få för litet folk?: *Wicksell* (*Knut*). De skattepliktiga förmögenheterna i Sverige vid slutet af år 1912: *Flodström* (*I.*).

INTERNATIONAL—

International Review of Commerce and Industry. *March*, 1914.—The relation of government to commerce. What co-operation has done for Ireland: *Pilkington* (*Col. Henry*), C.B. The Australian tariff and industry: "*Boreas.*" Imperial sources of supply of foodstuffs and raw products for industries: *Blacknell* (*L. L.*).

MONTHLY LIST OF ADDITIONS TO THE LIBRARY.

During the period that has elapsed since June 8, 1914, the Society has received the publications enumerated below.

Note.—Periodical publications are not included in this list, but they will be acknowledged at the end of the volume.

(a) Foreign Countries.

Austria—

Public Health. Statistik des Sanitätswesens für 1907-10. Fol. 1914. (The Central Statistical Commission.)

Belgium—

Recensement de l'Industrie et du Commerce (31 Decembre 1910). 1ère Partie, Recensement Professionnel. Vol. 1. Exposé des méthodes.—Cadre 1.—Nombre de personnes exerçant, soit comme profession principale, soit comme profession accessoire, une profession se rattachant à l'industrie ou au commerce. 4to. 1913. (The Royal Economic Society.)

—— Vol. 2. Cadre I. (Suite.) Cadres I bis, II et III.—Personnes exerçant à titre accessoire, des professions se rattachant à l'industrie ou au commerce. 4to. 1913. (*Id.*)

—— Vol. 3. Cadre IV.—Employés et ouvriers allant travailler dans une commune autre que celle où ils habitent.

—— Vol. 4. Cadre IV. (Suite.) 4 vols., 4to. 1914. (*Id.*)

Chile—

Sinopsis estadistica de la Republica de Chile [for 1912]. 126 pp., 8vo. 1914. (The Director-General of Statistics.)

France—

Labour. Conseil Supérieur du Travail. 23e Session.—Novembre 1913. Compte Rendu. Sm. 4to. 1914. (The French Labour Department.)

Germany—

Inland Navigation. Bestand der Deutschen Binnenschiffe am 31. Dezember 1912. 4to. 1914. (The Imperial Statistical Bureau.)

Prussia. Agriculture. Statistische Nachweisungen aus dem Gebiete der Landwirtschaftlichen Verwaltung von Preussen. Jahrgang 1912. 8vo. (The Minister of Agriculture.)

Dresden. Die Bibliothek der Gehe-Stiftung zu Dresden 1913. Systematisches und alphabetisches Zuwachsverzeichnis nebst Jahresbericht. 80 pp., 8vo. Dresden, 1914. (The "Stiftung.")

Japan—

Causes of Death. Statistique des décès pendant 1899-1908 (Nombres absolus et Moyennes). Par:—1, Affections de l'appareil digestif. 2, Affections de l'appareil respiratoire. 3, Cancer. 4, Maladies épidémiques chroniques (*a*) Lèpre, (*b*) Syphilis. 5, Maladies puerpérales. Par Néphrite. 7 vols., fol. 1914. (The Central Statistical Bureau.)

Norway—

Resumé rétrospectif, 1914. 50 pp., 8vo. 1914. (The Central Statistical Bureau.)

Labour. Recensement des métiers en 1910. III. Durée du travail. 8vo. 1914. (*Id.*)

—— Durée du travail dans l'industrie, Septembre 1913. 8vo. 1914. (*Id.*)

Russia—

Ministry of Commerce and Manufactures. Commerce and Manufactures of European Russia. 13 vols. and maps. 4to. [No date.] (In Russian.) (The Meteorological Office, London.)

(a) **Foreign Countries**—*Contd.*

Spain—

Estadistica del Impuesto de Tonelage creado por la Ley de Proteccion y Fomento de las Industrias y Comunicaciones maritimas de 14 de Junio de 1909. Años 1912 y 1913. 8vo. 1914. (The Director-General of Customs.)

Sweden—

Annuaire statistique de la Suède. 1ère Année 1914. 8vo. 1914. (The Central Statistical Bureau.)

Co-operation. Socialstatistik. Kooperativ Verksamhet i Sverige Åren 1908-10. 610 pp., 8vo. Stockholm, 1914. (*Id.*)

Folkmängden och dess Förändringar, 31 Dec. 1913. 42 pp. 8vo. 1914. (*Id.*)

United States—

Census Bureau. Bulletin No. 122. Estimates of Population, 1910-14. 24 pp., 4to. 1914. (The Bureau.)

Labour. Bulletin of Bureau of Labor Statistics. Whole Number 126. Workmen's Compensation Laws of the United States and Foreign Countries. 8vo. 1914. (The Bureau.)

—— Whole Number 143. Union scale of wages and hours of labour, May 15, 1913. 8vo. 1914. (*Id.*)

Illinois. University. Studies in Social Sciences. Numbers 2–4. 1913–14. 8vo. 1914. (The University.)

Ohio. Industrial Commission. Report No. 1. Wages and hours of labor of women and girls employed in mercantile establishments in Ohio in 1913. 33 pp., 8vo. 1914. (The Commission.)

Washington. University. Studies Published Quarterly. Vol. 1. Part 1. Number 2. January, 1914. 8vo. 1914. (The University.)

International—

Annuaire Statistique des Grandes Villes Européennes rédigé par le Professeur Dr. Gustave Thirring. Ie Année Ie Partie. 95 pp., 8vo. Budapest, 1913. (Dr. Gustave Thirring.)

(b) **India and Colonies.**

India—

Census of India, 1911. Vol. 19. Hyderabad State. Part 1, Report. Part 2, Imperial and Provincial Tables. 2 vols., fol. 1913. (The India Office.)

Canada—

Labour. Report on Labour organisation in Canada, 1913. 191 pp., 8vo. 1914. (The Department of Labour.)

Union of South Africa—

Natal Province. Report of Natal Fisheries Department, 1913. 14 pp., fol. 1914. (The Provincial Secretary.)

(c) **United Kingdom and its several Divisions.**

England and Wales—

Board of Agriculture and Fisheries. Fishery Investigations. Series 2. Sea Fisheries. Vol. 1, Part 1. (Report.) Report on Market Measurements in relation to the English Haddock Fishery during the years 1909–11. Fol. 1914. (The Board.)

Census of England and Wales, 1911. Vol. X. Occupations and Industries. Part 1. Containing Report and all Tables, except Table 13 (giving a Condensed List of Occupations of Males and Females at Ages in Administrative Counties, County Boroughs, &c.), which forms Part 2 of this volume. [Cd 7018.] 1914. (The Registrar-General.)

London County Council. Homeless Persons. Census of, taken on night of February 13, 1914. Fol. 1914. (Purchased.)

Port of London Authority. London: The Port of the Empire. Ob. 8vo. 1914. (The Authority.)

(d) Authors, &c.

Alderson (*Albert W.*). Causes and Cure of Armaments and War . . . &c., &c. 17 pp., 8vo. 1914. (P. S. King and Son.)

Ashley (*William James*), M.A. Economic Organisation of England: an outline history. Lectures delivered at Hamburg. viii + 213 pp., 8vo. London, 1914. (Longmans and Co.)

Auspitz (*Rudolf*) and *Lieben* (*Richard*). Recherches sur la Théorie du Prix. Traduit par Louis Suret. Vol. 1. Texte. Vol. 2. Album. 2 vols., 8vo. Paris, 1914. (Giard and Brière.)

Bachi (*Riccardo*). L'Italia economica nel 1913. (Supplement to "La Riforma Sociale.") 313 pp., 8vo. Torino, 1914. (The Editor.)

Bailward (*W. A.*), M.A. Recent Developments of Poor Relief. (Reprinted from "Economic Journal," December, 1912, with Postscript (1914)). 46 pp., sm. 8vo. 1914. (P. S. King and Son.)

Brown (*John Calvin*). The cure for poverty. 360 pp., 8vo. London, 1914. (Stanley Paul and Co.)

Buelens (*J.*)—

Les employés en Allemagne. Leur situation sociale et leur contrat d'emploi, legislation et revendications. xv + 325 pp., 8vo. Anvers, 1913. (C. and H. Courtin.)

Les employés en Autriche. Leur situation et leur contrat d'emploi. 92 pp., 8vo. Anvers, 1914. (*Id.*)

Bulkley (*Miss M. E.*). The Feeding of School Children. With introductory note by R. H. Tawney (Ratan Tata Foundation). xvi + 278 pp., 8vo. London, 1914. (G. Bell and Sons.)

Chapman (*S. J.*) and *Shimmin* (*Arnold M.*). Industrial Recruiting and the Displacement of Labour. 55 pp., 8vo. Manchester, 1914. (The Authors.)

Craik (*Sir Henry*), K.C.B., M.P. The State in its relation to Education. New and revised edition. (English Citizen Series.) xiv + 196 pp., 8vo. London, 1914. (Macmillan and Co.)

Davenport (*C. B.*). Statistical Methods with Special Reference to Biological Variation. Third, Revised Edition. viii + 225 pp., sm. 8vo. New York, 1914. (John Wiley and Sons.)

Dawson (*William Harbutt*). Municipal Life and Government in Germany. xvi + 507 pp., 8vo. 1914. (Longmans Green and Co.)

Eugenics: Twelve University Lectures by M. A. Aldrich, W. H. Carruth, C. B. Davenport, C. A. Ellwood, A. Holmes, W. H. Howell, H. E. Jordan, A. G. Keller, E. L. Thorndike, V. C. Vaughan, H. J. Webber, R. H. Wolcott. With a Foreword by Lewellys F. Barker. xiii + 348 pp., 8vo. New York, 1914. (Dodd, Mead and Co.)

Herbertson (*A. J.*) and *Howarth* (*O. J. R.*), Editors. The Oxford Survey of the British Empire. General survey including administration, legal problems, history, defence, education, . . . vi + 386 pp., 8vo. Oxford, 1914. (Oxford University Press.)

Hobson (*J. A.*). Work and Wealth: A Human Valuation. xvi + 367 pp., 8vo. London, 1914. (Macmillan and Co.)

Macdonald (*Arthur*). Study of Man in connection with establishing Laboratories to investigate Criminal, Pauper, and Defective Classes. 11 pp., 8vo. 1914. (The Author.)

Marconcini (*Federico*). L'Industria Domestica Salariata nei Rapporti Interni e Internazionali con Prefazione di Achille Loria. 847 pp., 8vo. Torino, 1914. (F. Bertinatti).

Marriott (*J. A. R.*). The English Land System. A sketch of its historical evolution in its bearing upon national wealth and welfare. x + 168 pp., 8vo. London, 1914. (Mr. J. Murray.)

Mayr (*Dr. Georg von*). Statistik und Gesellschaftslehre. Erster Band. Theoretische Statistik. Zweite umgearbeitete und vermehrte Auflage. (Aus Handbuch des Oeffentlichen Rechts: Einleitungsband). vii + 357 pp., 8vo. Tubingen, 1914. (J. C. B. Mohr.)

(d) Authors, &c.—*Contd.*

Merriman (*Mansfield*). A List of Writings Relating to the Method of Least Squares, with Historical and Critical Notes. (From the Transactions of the Connecticut Academy, vol. iv, 1877.) 82 pp., 8vo. 1877. (Prof. F. Y. Edgeworth, M.A.)

Mookosseyer (*V.*). The Russian Money Market. [In Russian.] 59 pp., 8vo. St. Petersburg, 1914. (The Author.)

Mortara (*Giorgio*)—

Il prodotto dei trasporti di merci sulle linee ferroviarie italiane. 11 pp., 8vo. Rome, 1913. (*Id.*)

Numeri indici dello stato e del progresso economico delle Regioni Italiane. 15 pp., 8vo. Rome, 1913. (*Id.*)

Numeri indici delle condizioni economiche d'Italia. 14 pp., 8vo. Rome, 1913. (*Id.*)

Nuove ricerche sulla mortalità italiana. 15 pp., 8vo. 1914. (*Id.*)

Sintomi statistici delle condizioni economiche d'Italia. 30 pp., 8vo. Rome, 1914. (*Id.*)

Studi di Semiologia economica. I. Sintomi statistici delle condizioni economiche della Francia. II. Sull' impiego del coefficiente di correlazione nella Semiologia economica. 39 pp., 8vo. Rome, 1914. (*Id.*)

North (*S. N. D.*) Co-operation and Unification in Federal and State Statistical Work. . . . Resolutions on Co-operative Work and Synopsis of Federal and State Laws. 48 pp., 8vo. Washington, 1903. (The Bureau of the Census.)

Pasquet (*D.*). Londres et les ouvriers de Londres. 763 pp., maps, 8vo. Paris, 1914. (M. Armand Colin.)

Pearl (*Raymond*) and *Salaman* (*Redcliffe N.*). The Relative Time of Fertilization of the Ovum and the Sex Ratio amongst Jews. 7 pp., 8vo. 1914. (Mr. R. N. Salaman.)

Pearson (*Karl*), F.R.S. Tables for Statisticians and Biometricians. Issued with assistance from Grant made by the Worshipful Company of Drapers to the Biometric Laboratory, University College, London. lxxxiii + 143 pp., 4to. 1914. (Purchased.)

—— and *Jaederholm* (*Gustav A.*). Mendelism and the Problem of Mental Defect. II. On the Continuity of Mental Defect. With four diagrams. Questions of the Day and of the Fray, No. VIII. 47 pp., 8vo. 1914. (*Id.*)

Poincaré (*Henri*). Science and Method. Translated by Francis Maitland. With a Preface by the Hon. Bertrand Russell, F.R.S. 288 pp., 8vo. 1914. (T. Nelson and Sons.)

Quetelet (*M. A.*). Treatise on Man and the Development of his Faculties. x + 174 pp., 8vo. 1842. (Prof. F. Y. Edgeworth, M.A.)

Ricci (*Umberto*)—

Sulla Media Aritmetica Ponderata. 44 pp., 8vo. Torino, 1912. (The Author.)

I Limiti della Statistica. 29 pp., 8vo. Rome, 1913. (*Id.*)

Sulle Divergenze fra Statistiche del Movimento Commerciale. 78 pp., 8vo. Torino, 1914. (*Id.*)

Roesle (*Dr. E.*). Der Geburtenrückgang. Seine Literatur und die Methodik seiner Ausmassbestimmung. Ergänzungshefte zu dem Archiv für Soziale Hygiene und Demographie Eegängungshefte Nr. 1. 76 pp., 8vo. Leipzig, 1914. (*Id.*)

Roulleau (*Gaston*). Société de statistique de Paris. Les règlements par effets de commerce en France et à l'étranger. Ouvrage couronné (Prix Emil Mercet). vi + 204 pp., la. 8vo. Paris, 1914. (2 copies.) (*Id.*)

Rozenraad (*C.*)—

Highest and Lowest Rates of Exchange on London during First Half Year of 1914 on 21 of Principal Money Markets. Sheet fol. 1914. (The Compiler.)

Table comparing Gold and Silver Stock of principal European Banks of issue, their Bank rate, &c., at end of June 1913 and 1914. Sheet. (*Id.*)

Rubinow (*I. M.*). Social Insurance. vii + 525 pp., 8vo. London, 1913. (Williams and Norgate.)

(d) Authors, &c.—*Contd.*

Schmidt and *Wild*. Armenwesen der Schweiz. Band 1. Das Gesetzliche Armenwesen in der Schweiz. Das Armenwesen des Bundes, Samtlicher Kantone und der Schweizerischen Grosstadte. Band 2. Das Organisierte Freiwillige Armenwesen in der Schweiz mit Sachregister. 2 vols., 8vo. Zurich, 1914. (Art. Institut Orell Fussli.)

Sheppard (Dr. W. F.)—

Factorial Moments in Terms of Sums or Differences. 16 pp., 8vo. 1913. (The Author.)

Fitting of Polynomial by Method of Least Squares (Solutions in Terms of Differences or Sums). 12 pp., 8vo. 1913. (*Id.*)

Graduation by Reduction of Mean Square of Error. 15 pp., 8vo. 1914. (*Id.*)

Taussig (F. W.), LL.B. Tariff History of the United States. Sixth Edition, revised with additional material, including a Consideration of the Tariff of 1913. xi + 465 pp., 8vo. London, 1914. (G. P. Putnam's Sons.)

Tawney (R. H.). Studies in the Minimum Wage No. 1. The Establishment of Minimum Rates in the Chain-making Industry under the Trade Boards Act of 1909. xiii + 157 pp., sm. 8vo. London, 1914. (G. Bell and Sons, Ltd.)

Terry (Schuyler B.). The Financing of the Hundred Years' War, 1337-60. xx + 197 pp., 8vo. London, 1914. (Constable and Co., Ltd.)

Vissering (Dr. G.). On Chinese Currency. Preliminary Remarks on the Monetary and Banking Reform in China. Vol. 2. The Banking Problem. xvii + 299 pp., 8vo. Amsterdam, 1914. (J. H. de Bussy.)

Wade (John). History and Political Philosophy of the Middle and Working Classes. Fourth Edition, Considerably Extended. (Bound up with work by *Quetelet (A.)*, A Treatise on Man.) 174 pp., 8vo. 1842. (Prof. F. Y. Edgeworth, M.A.)

Williams (M. H.), M.B., *Bell (Julia)*, M.A., and *Pearson (Karl)*, F.R.S. A Statistical Study of Oral Temperatures in School Children, with special reference to Parental, Environmental and Class Differences. Drapers' Company Research Memoirs. Studies in National Deterioration. IX. 124 pp., 4to. 1914. (Purchased.)

Withers (Hartley). Poverty and Waste. ix + 180 pp., 8vo. London, 1914. (Smith, Elder and Co.)

Wood (Sir Henry Trueman). History of the Royal Society of Arts. With a Preface by Lord Sanderson, G.C.B. xviii + 558 pp., 8vo. London, 1913. (The Author.)

Wood (T. B.), M.A., and *Yule (G. Udny)*, M.A. Statistics of British Feeding Trials and the Starch Equivalent Theory. 19 pp., 8vo. 1914. (Mr. G. Udny Yule.)

Woods (Frederick Adams). The Influence of Monarchs. Steps in a new science of history. xiii + 422 pp., 8vo. New York, 1913. (Macmillan and Co.)

Yule (G. Udny), M.A. Fluctuations of Sampling in Mendelian Ratios. 8 pp., 8vo. 1914. (The Author.)

(e) Periodicals, &c. (British), and Miscellaneous.

Business Statistics Co. Northern Coal, Iron and Steel Companies, showing capital of each company, last balance sheets, profits, &c., over a number of years. 1914. 125 pp., sm. 12mo. 1914. (The Co.)

Catholic Studies in Social Reform. A Series of Manuals edited by the Catholic Social Guild. VI. Christian Citizenship, by the Rev. Thomas Wright. 80 pp., 8vo. 1914. (P. S. King and Sons.)

—— VII. The Drink Question, by the Rev. Joseph Keating. 105 pp., 8vo. 1914. (*Id.*)

Tariff Commission Report. The Budget and Agriculture. Proposals Relating to Local Taxation. 4 pp., 4to. 1914. (The Tariff Commission.)

—— Second Report of Agricultural Committee. 24 pp., 4to. 1914. (*Id.*)

—— The Budget and Direct Taxation. 11 pp., 4to. 1914. (*Id.*)

ANNUAL LIST OF ADDITIONS TO THE LIBRARY.

Since July 7, 1913, the Society has received the periodical publications enumerated below. They are arranged alphabetically by subjects (works of a general nature coming first) under the following heads:—(a) Foreign Countries; (b) India and Colonial Possessions; (c) United Kingdom and its Divisions; (d) Societies, &c. (British); (e) Periodicals, &c. (British).

(a) **Foreign Countries.**

Argentine Republic—
Year-book of Direction General of Statistics, 1911. Agricultural Statistics. Trade Returns (quarterly) for 1913–14.
Cordoba (Province). Statistical Year-book for 1912.
Tucuman (Province). Statistical Year-book for 1910–12.
Buenos Aires (City). Year-book for 1910–12.

Austria-Hungary—
Railway Returns for 1912. Trade Returns for 1912–13. Report of Permanent Commission for Custom Values for 1912. "Compass" Financial Year-book for 1914.

Austria—
Statistical Hand-book for 1912. Statistical Year-book for Self-governing Countries, 1913. Agricultural Statistics for 1913. Births, Deaths, and Marriages, Statistics of, for 1911. Education Statistics for 1909-10. Financial Statistics for 1912-13. Judicial Statistics (Criminal) for 1910. Labour: General Reports of the Labour Department for 1912 and 1913. Strikes and Lockouts in 1912. Overtime in Factories and Workshops in 1912. Arbitration in Labour Disputes in 1910. Mineral Statistics for 1912. Miners Sickness Statistics for 1911. Postal Statistics for 1912. Savings Banks Statistics for 1911. Salt Monopoly Returns for 1911. Statistics of Sales for 1912.
Bosnia and Herzegovina. Trade Returns for 1912.
Bohemia. Agricultural and other Statistics for 1911–13.
Cracow. Statistical Year-book for 1912.

Belgium—
Statistical Year-book for 1912. Army Medical Statistics for 1912. Labour Returns, 1912–13. Trade Returns for 1912.
Brussels. Annual Health Report for 1912.
Liége. Report on Improved Housing for the Working Classes in 1913. Year-book of Royal Academy of Belgium for 1914.

Brazil—
Trade Returns for 1911 and 1912.

Bulgaria—
Agricultural Statistics for 1910 and 1911. Army Recruiting Returns for 1907–09. Births, &c., in 1908. Judicial Statistics for 1910. Trade Returns for 1911.

Chile—
Statistical Year-book for 1911–12. Trade Returns for 1912.

China—
China Year-book for 1913. List of Lighthouses, &c., 1914. Post Office Report for 1912. Trade Returns for 1912.

Colombia—
Bulletin of the Ministry of Foreign Relations for 1912–13.

(a) **Foreign Countries**—*Contd.*

Cuba—

Bulletin of Ministry of Agriculture for 1913. Immigration Returns for 1912. Railway Statistics for 1908–09. Trade Returns for year 1911–12.

Denmark—

Statistical Year-book for 1913. Statistical Miscellany, 1913–14. Trade Returns for 1912.

Copenhagen. Annual Health Report for 1912.

Egypt—

Statistical Year-book for 1913. Cotton Crop Monthly Statistics for 1913. Financial Report on Public Debt for 1913. Postal Report for 1913. Public Health and Vital Statistics for 1912–14. Trade and Navigation Returns for 1913. Report of Committee for Preservation of Monuments of Arabic Art for 1912. L'Égypte Contemporaine for 1913–14.

France—

Statistical Year-book for 1912. Bulletin of General Statistics, 1913-14. Agricultural Statistics for 1911. Inland Navigation Statistics for 1912. Judicial Statistics, Civil for 1910 and 1911, Criminal for 1911. Labour Statistics (Strikes) for 1912. Mineral Statistics for 1911. Mint Report for 1913. Poor Relief Statistics for 1911. Prison Statistics for 1911 and 1912. Railway Statistics, Local for 1910 and 1911, General for 1911. Trade and Navigation Returns for 1912. Bank of France Report for 1913.

Colonies. Trade and Navigation Returns for 1911. Mineral Statistics for 1911.

Paris. Statistical Year-book for 1911. Statistical Society Journal and Year-book for 1913-14. British Chamber of Commerce, Annual Report for 1913.

Germany—

Statistical Year-book for 1913 and 1914. Births, &c., in 1910 and 1911. Inland Navigation Returns for 1911 and 1912. Insurance Returns (Accident, Old Age, and Sickness) for 1912 and 1913. Joint Stock Companies' Returns for 1911-12. Judicial Statistics (Civil and Criminal) for 1911. Labour Statistics (Strikes and Lockouts) for 1913. Municipal Statistical Year-book of German Towns dated 1913. Annual Report of Conference of Municipal Statisticians, 1912. Trade and Navigation Returns for 1912.

Alsace-Lorraine. Statistical Year-book 1913-14.

Baden. Statistical Year-book for 1913. Labour Statistics for 1912.

Prussia. Statistical Year-book for 1913. Co-operative Credit Bank Returns for 1911.

Saxony. Statistical Year-book for 1913.

Wurtemburg. Statistical Year-book dated 1913.

Berlin. Statistical Year-book dated 1913. Sickness Insurance Returns for 1912. German Actuarial Society, Report for 1913.

Düsseldorf. Annual Statistics for 1913.

Frankfort. Annual Statistics for 1912–13. Vital Statistics for 1913.

Hamburg. Trade and Navigation Returns for 1913.

Greece—

Trade Returns for 1912.

Honduras—

The Economic Review, 1913-14.

Hungary—

Navigation Returns of Fiume for 1911. Trade Returns for 1912. Workmen's Insurance in 1909.

Budapest. Statistical Year-book for 1907–08.

(a) **Foreign Countries**—*Contd.*

Italy—

Statistical Year-book for Italian Towns, 1913–14. Agricultural Returns, 1912–13. Births, Deaths, and Marriages, Statistics of, for 1911. Causes of Death, Returns of, in 1911. Trade Returns for 1912.

Florence. Year-book of the "Cesare Alfieri" Institute of Social Science for 1913–14.

Turin. Municipal Year-book for 1912–13.

Venice. Bulletins of Statistics for 1913–14.

Japan—

Statistical Abstract dated 1913 and 1914. Financial and Economic Annual for 1913. Births, Deaths and Marriages in 1910. Causes of Death in 1910.

Korea. Annual Report on Reforms and Progress in Korea, 1911–12.

Luxemburg—

Agricultural Statistics for 1913.

Mexico—

Mexican Year-book for 1914. Bulletin of the "Direction" General of Statistics for 1913. Bulletin of Department of Labour, 1913–14. Geographical and Statistical Society of Mexico: Bulletins for 1913. Trade Returns, 1912–13.

Netherlands—

Statistical Year-book for 1912 (Colonies, for 1911). Births, Deaths and Marriages in 1912. Bankruptcy Statistics for 1912. Finance (State and Municipal) Statistics for 1911–12. Judicial Statistics (Criminal) for 1911. Labour Statistics for 1912. Poor Relief Statistics for 1911. Prison Statistics for 1912. Public Health Report for 1912. Reformatories, Statistics of, for 1911–12. Trade and Navigation Returns for 1912. Savings Banks Returns for 1910–11.

Norway—

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APPENDIX.

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(Founded 1834. Incorporated 1887.)

9, ADELPHI TERRACE.

STRAND, LONDON, W.C.

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From its inception the Society has steadily progressed. It now possesses a valuable Library of about 50,000 volumes, and reading rooms. Monthly meetings, which are well attended and cultivate among its Fellows an active spirit of investigation, are held from November to June. The Papers read at these meetings, with an abstract of the discussions thereon, are published in the *Journal*, which now consists of seventy-seven annual volumes, and forms of itself a valuable library of reference.

The Society has originated and statistically conducted many special inquiries on subjects of economic or social interest, of which the results have been published in the *Journal*, or issued separately.

The Society is cosmopolitan, and consists of Fellows and Honorary Fellows, together forming at the present time a body of about *nine hundred* Members.

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The Rt. Hon. Lord Welby, G.C.B.	1914-

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W. H. Clark, C.M.G.	1909–10
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Those marked *c* have Served or are Serving on the Council.

" *d* have made Presentations to the Library.

" *p* have contributed Papers to the Society.

" * have compounded for their Annual Subscriptions.

Year of Election.		
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1908		Allen, H. C., *Buenos Ayres Gt. Southern Rly.Co., Ltd.,* *River Plate House, Finsbury Circus, E.C.*
1898		Allen, William H., *Bromham House, Bromham, near Bedford.*

Year of Election.		
1880		*Allerton, The Right Hon. Lord, *Chapelallerton, Leeds.*
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1907	*d*	Andersson, Thor E. E., Ph.D., *Ringparken, 80, Saltsjobaden, Sweden.*
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1913		Babson, Roger Ward, *Wellesley Hills, Massachusetts, U.S.A.*
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Year of Election.		
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1886		Balfour, The Right Hon. Gerald W., *Fishers-hill, Woking.*
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Year of Election.		
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1882	c d	*Beeton, Henry R., 9, *Maresfield-gardens, Hampstead, N.W.*
1899	d	Beeton, Mayson M., B.A.,
1886	d	Begg, Ferdinand F., *Bartholomew House, E.C.*
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1914		Bellman, Harold, "*Trevaylor,*" *Chevening - road, Brondesbury Park, N.W.*
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1902		Bisset-Smith, George T., 16, *St. Thomas-road, Grange, Edinburgh.*

Year of Election.		
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1911		Bobart, H. H., *Weavers' Hall*, 22, *Basinghall-street, E.C.*
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1887	*c*	Bond, Edward, M.A., 43, *Thurloe-square, S.W.*
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1913		Butler, Dr. William, 26, *Craven Park-road, Harlesden, N.W.*
1892		Byworth, Charles J., F.S.A.A., *The Limes, Sutton Common-rd., Benhilton, Surrey.*

Year of Election.		
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1897		Cairnes, Frederick E., *Killester House, Raheny, Co. Dublin.*
1911	*d*	Callie, J. W. S., 18, *Hackin's Hey, Liverpool.*
1911		Campbell, Charles W., C.M.G., *Great Hollanden, Underriver, Sevenoaks.*
1905	*d*	Campbell, Richardson, 3, *St. Mary's-rd., Higher Crumpsall, Manchester.*
1879		Campbell-Colquhoun, Rev. John E., *Chartwell, Westerham, Kent.*
1889	*d p*	Cannan, Prof. Edwin, M.A., LL.D., 11, *Chadlington-road, Oxford.*
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1900	*d*	Canovai, Commendatore Tito, *Bank of Italy, Rome.*
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1910		Carr-Saunders, A. M., M.A., *Milton Heath, Dorking.*
1910		Carson, H. C., 193, *Jackson-street, W., Hamilton, Canada.*
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1883	*d*	*Carter, Joseph R., *Old Hall, Wallington, Surrey.*
1911		Cassel, Felix, K.C., M.P., 25, *Bryanston-square, W.*
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1913		Chadwick, Percy, 11, *Horsham-avenue, North Finchley, N.*
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1886	*d p*	*Chapman, Samuel, *Billiter-buildings, Billiter-street, E.C.*
1903	*c d p*	*CHAPMAN, PROFESSOR SYDNEY J., M.A., *Owens College, Manchester.*
1901	*d*	Chapman, Walter W., 4, *Mowbray House, Norfolk-street, Strand, W.C.*
1904		Charles, Thomas E., 52, *Sandrock-road, Lewisham, S.E.*

Year of Election.		
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1913		Chaston, John, F.C.I.S. "*Loudin.*" *Roundhill-road, Kettering.*
1892		*Chatham, James, F.I.A., F.F.A., 7, *Belgrave-crescent, Edinburgh.*
1912		Chen, Yi, *Auditor-General's Office, Peking, China.*
1903	d	Chiozza-Money, Leo G., M.P., *The Grey House, Hampstead-lane, N.*
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1910		Christian, Edward Alan, 55, *Grange Mount, Birkenhead.*
1904		Clark, Prof. Arch. Brown, *University of Manitoba, Winnipeg, Canada.*
1909		Clark, Albert Hawkins, A.M.I.C.E., *Sunningdale, Molesey, Surrey.*
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1877	c d	*Clarke, Henry, L.R.C.P., *Courns Wood, Hughenden, High Wycombe.*
1908		Clarke, John J., 48, *Laurel-road, Fairfield, Liverpool.*
1899		Claughton, Sir Gilbert H., Bart., *The Priory, Dudley.*
1907		Clements, Lieut.-Col. H. C., V.D., 13, *Larpent-avenue, Putney, S.W.*
1911		Coates, Norman, *City Hall, Cardiff.*
1911	d	Coats, Robert Hamilton, B.A., *Department of Labour, Ottawa, Canada.*
1893	c d p	COGHLAN, SIR TIMOTHY A., I.S.O., 123 *and* 125, *Cannon-street, E.C.*
1905		*Cohen, C. Waley, M.A., 11, *Hyde Park-terrace, W.*
1859		Coles, John, F.I.A., 4, *Kensington Park-gardens, W.*
1905		Coles, Richard J., F.C.I.S., *Addenbrooke's Hospital, Cambridge.*
1913		Collard, William, 120, *St. Julian's Farm-rd., West Norwood, S.E.*
1892	d p	*Collet, Miss Clara E., M.A., *Board of Trade, Gwydyr House, Whitehall, S.W.*
1895		Collins, Howard J., *The General Hospital, Birmingham.*

Year of Election.		
1906		Collins, Percy. 81–83, *Cheapside, E.C.*
1882		*Collum, Rev. Hugh R., M.R.I.A., F.R.C.I., 35, *Oakley-street, Chelsea, S.W.*
1912	*d*	Conacher, H. M., 29, *St. Andrew-square, Edinburgh.*
1911		Constable, W. G., 17, *Denning-road, Hampstead, N.W.*
1911		Cook, Arthur James, A.I.A., M.J.I. (Hon.), 31, *Upper Brook Street, Park Lane, W.*
1887		Cooke-Taylor, R. Whately, *High Trees, Chepstow.*
1891	*d*	Cooper, Joseph, 27, *Kildare-street, Farnworth, near Bolton.*
1911		*Cory, Sir Clifford John, Bart., M.P., *Llantarnam Abbey, Monmouthshire.*
1899	*d*	Court, Stephen E., *Central Office for Unemployed Insurance, Queen Anne's Chambers S.W.*
1862	*c d p*	Courtney, Right Hon. Lord (*Hon. Vice-President*), 15, *Cheyne Walk, Chelsea, S.W.*
1902		*Coxon, William. 15, *Elsworthy-terrace, N.W.*
1874	*c d p*	Craigie, Major P. G., C.B. (*Hon. Vice-President*), *Bronté House, Lympstone, Devon.*
1910	*p*	Crammond, Edgar, 37, *Gorsehill-road, New Brighton, Cheshire.*
1902		Craven, Edward J. E., *Secretary's Office, H.M. Customs and Excise, Ocean House, E.C.*
1890	*c d p*	Crawford, Sir Richard F., K.C.M.G., *c/o F. R. Sneath Esq.*, 1, *New-court, Lincoln's Inn, W.C.*
1891		*Crawley, Charles E.,
1878		Crewdson, Ernest, *Grinstead, Green-lane, Buxton, Derbyshire.*
1890		Croal, David O., *Financial News*, 111, *Queen Victoria-street, E.C.*
1911	*d*	Cunningham, George H., *Valley-cottage, New York, U.S.A.*
1883	*c d*	Cunningham, The Venble. Archdeacon, D.D., 2, *St. Paul's-road, Cambridge.*

Year of Election.		
1910		Dale, Augustus Charles, I.S.O., *Braemar Cottage, Maitland, Cape Town.*
1900		Dale, Charles E., F.S.A.A., C.M.G., *Old Calabar, West Africa.*
1910		Dalton, Hugh, 1, *Cloisters, Temple, E.C.*
1898	*d*	*Danson, Francis C., *Tower Buildings, Water-street, Liverpool.*
1901	*d*	Danvers, Ernest, F.R.G.S., *B. Mitre* 427, *Buenos Ayres.*
1909		Darton, Oscar, F.C.A., 10, *Old Jewry Chambers, London, E.C.*
1897	*d p*	*Darwin, Major Leonard, R.E., F.R.G.S., 12, *Egerton-place, S.W.*
1913		Datta, Krishna Lal, M.A., 16/1, *Ramkanta Bose-street, Calcutta, India.*
1901		Davies, Dixon H., *Great Central Ry., Marylebone Station, N.W.*
1869		Davies, James M., 168, *St. Vincent-street, Glasgow.*
1899		Dawson, Miles M., F.A.S., F.I.A., 76, *William-street, New York, U.S.A.*
1903	*d*	Dawson, Sidney S., F.C.A., F.C.I.S. 51, *North John-street, Liverpool.*
1880		Debenham, Frank, 1, *Fitzjohn's-avenue, Hampstead, N.W.*
1914		De Jastrzebski, Thaddeus Theodore S., *General Register Office, Somerset House, W.C.*
1900	*d*	De la Plaza, Victorino, LL.D. (*Buenos Ayres Ry. Co.*), *Poste Restante, Buenos Ayres.*
1911	*d*	Denham, E. B., 66, *Curzon-street, W.*
1907		Denman, Hon. Richard D., M.P., 35, *Campden-hill-road, W.*
1891		Denne, William, *Lancaster Villa, Beltinge, Herne Bay.*
1873		Dent, Edward, 2, *Carlos-place, Grosvenor-square, W.*
1887		Dent, George M., 20, *Park-avenue, Southport.*
1889		De Rothschild, Leopold, D.L., 5, *Hamilton-place, Piccadilly, W.*
1892		De Smidt, Henry, C.M.G., *The Cottage, Gordon-road,* *Kenilworth, near Cape Town.*
1892		Dewar, William N., *c/o The Colonial Mutual Life Ass.* *Soc., Ltd., Adderley-st., Cape Town, S. Africa.*
1900		Dewsnup, Professor Ernest R., M.A., F.R.G.S., *University of Illinois, Urbana, Ill., U.S.A.*
1906	*d*	*Dick, Godfrey W., A.I.A.N., *c/o P.O. Box No.* 28, *The Point, Port Natal, S. Africa.*

Year of Election.		
1908		Dickson, Professor Henry N., M.A., D.Sc., F.R.S.E., 160, *Castle-hill, Reading.*
1903		Digby, W. Pollard, 18, *Westminster Palace-gardens, Victoria-street, S.W.*
1914		Domingo, Alfred William, *c/o Messrs. Grindlay & Co., Bankers*, 11, *Hastings-street, Calcutta, India.*
1899	*d*	Dougharty, Harold, A.I.A., F.C.I.S., *"Ardmore," Stanthorpe-road, Streatham, S.W.*
1913		Douie, Sir James Macrone, K.C.S.I., 2, *Chadlington-road, Oxford.*
1894	*c d p*	DRAGE, GEOFFREY, M.A., 29, *Cadogan-square, S.W.*
1897	*c d p*	DUDFIELD, REGINALD, M.A., M.B., 19, *Blomfield-road, Maida Vale, W.*
1895	*c*	Dudley, The Right Hon. The Earl of, 7, *Carlton-gardens, S.W.*
1909		Duffell, James H., A.I.A., *Royal London Mutual Ins. Soc., Ltd., Finsbury-square, E.C.*
1911		Dunbar, Alexander, *Board of Agriculture and Fisheries*, 3, *St. James's-square, S.W.*
1902	*c d*	Dunbar, Sir William C., Bart., C.B., 8, *Onslow-square, S.W.*
1908		Dungey, Miss M. E., B.Sc., *Glendower, Clinton-road, Redruth, Cornwall.*
1878	*c*	*Dunraven, The Right Hon. the Earl of, K.P., C.M.G., *Kenry House, Putney Vale, S.W.*
1910		*Duveen, Edward J., *Gangmoor, Hampstead Heath, N.W.*
1904		Dymant, Arthur F., *Rowantree House, Winchmore Hill.*
1888	*d*	Eckersley, J. C., M.A., F.R.G.S., *Carlton Manor, Yeadon, Leeds.*
1883	*c d p*	EDGEWORTH, PROF. FRANCIS Y., M.A., F.B.A. *(Hon. Vice-President), All Souls', Oxford.*
1896	*p*	Edwards, C. Lewis, F.S.A.A., *"Santa Caterina," Loudwater, Bucks.*
1908		Eldridge, Ernest E. B., A.I.A., 39-41, *New Broad-street, E.C.*
1908	*d*	Ellinger, Barnard, *Ashleigh, Buxton.*

Year of Election.		
1885	c d p	Elliott, Sir Thomas H., K.C.B., *The Royal Mint, Tower Hill, E.*
1885		*Elliott, William, *Southern Life Office, Cape Town.*
1910	d	Eve, H. Trustram, 2, *St. Paul's-square, Bedford.*
1913		Eveleigh, F. W. Anton, A.S.A.A., *P.O. Box* 3531, *Johannesburg, S. Africa.*
1896		Everett, Percy W., *Oaklands, Elstree, Herts.*
1877	c d p	EVERSLEY, THE RIGHT HON. LORD (*Hon. Vice-President*), *Abbotsworthy House, Kingsworthy, Winchester.*
1892		Faber, Harald, *Fiona, Lennard-road, Penge, S.E.*
1910		Fabini, Herman Victor, 22, *Mincing-lane, E.C.*
1911		Faraday, W. B., LL.B., 6, *Fig Tree-court, Temple, E.C., and "Lessenden" Budleigh Salterton, Devon.*
1889	d	Farnworth, Edward J., F.S.A.A., 26, *Winckley-square, Preston.*
1890		Faulks, Joseph E., B.A., F.I.A., 83, *Brondesbury-road, N.W.*
1893		*Fawcett, Mrs. M. G., 2, *Gower-street, W.C.*
1913		Fay, C. R., *Christ's College, Cambridge.*
1882		Fell, Arthur, M.A., M.P., 46, *Queen Victoria-street, E.C.*
1894		Fellows, Rowland H., F.I.A., 41, *Montrose-avenue, Kilburn, N.W.*
1913		Fidler, Walter, *Office of Woods*, 1, *Whitehall, S.W.*
1914		Finch, Frank, 117, *Embleton-road, Ladywell, S.E.*
1889		*Finlay, Major Alexander, *The Manor House, Little Brickhill, Bletchley.*
1911		Fischer, Arne, 165, *Broadway, New York, U.S.A.*
1900	d	Fisher, Professor Irving, Ph.D., *Yale University, New Haven, Conn., U.S.A.*

Year of Election.		
1885		*Fitz-Gerald, Lt.-Col. Wm. G., M.A., F.R.Hist.S.,
1900	*d*	Fleming, Owen, Assoc. R.I.B.A., 3, *Warwick House-street, Charing Cross, S.W.*
1914		Floud, Francis Lewis Castle, *Board of Agriculture and Fisheries, 4, Whitehall-place, S.W.*
1893	*c d p*	*FLUX, ALFRED W., M.A. (*Hon. Secretary*). *Board of Trade, Gwydyr House, Whitehall, S.W.*
1889	*d*	Foot, Alfred. *"Kildare" 2, Preston-rd., Westcliff-on-Sea, Essex.*
1893		Fortune, David, J.P., *Scottish Legal Life Assurance Society, 84, Wilson-street, Glasgow.*
1901		Foster, Harry S., D.L., *Grosvenor Mansions, 82, Victoria-street, S.W.*
1897	*c*	Fountain, Henry, C.M.G., *Board of Trade, Whitehall-gardens, S.W.*
1878	*c d*	Foxwell, Professor H. Somerton, M.A., F.B.A., 1, *Harvey-road, Cambridge.*
1894		Francis, Joseph, J.P., *National Benefit Life and Property Ass. Co., Ltd., National House, Newgate-street, E.C.*
1887		Frankland, Frederick W., F.I.A., *"Okataina," Foxton, Manawatu, N. Zealand.*
1899		Franklin, Arthur E., F.R.G.S., 35, *Porchester-terrace, W.*
1911		Fraser, Drummond Drummond, *Manchester and Liverpool District Bank, Manchester.*
1913	*d*	Fraser, Malcolm, Government Statistician. *Wellington, New Zealand.*
1902		Fremantle, Professor Henry E. S., *Library of Parliament, Cape Town.*
1911		Frewen, Moreton. *Brede Place, Sussex.*
1886		Fuller, George P., *Neston-park, Corsham, Wilts.*
1878		Fuller, William P., *Stone Lodge, Cheam, Surrey.*
1908		Furniss, Henry S., M.A., *Whirlow House, Oxford.*

1902	*d*	Gait, Edward A., C.S.I., C.I.E., I.C.S., *Census Commissioner for India, Simla, India.*
1852		Galsworthy, Sir Edwin H., J.P., 26, *Sussex-place, Regent's-park, N.W.*

Year of Election.		
1887	*d*	Garcke, Emile. *Electrical Federation Office, Kingsway, W.C.*
1910	*d*	Garnsey, Gilbert Francis, A.C.A., *Messrs. Price, Waterhouse & Co., 3, Frederick's-place, Old Jewry, E.C.*
1909		Gaskell, Thomas Penn, M.I.C.E., *Townshend House, North-gate, Regent's-park, N.W.*
1904		*Gates, Chasemore P., *c/o Anglo-Chilian Nitrate and Railway Company, Tocopilla, Chile.*
1880		*Gates, John B., A.C.A., *The Old Mansion House*, 73, *Cheapside, E.C.*
1907		Gemmill, William, F.I.A., *P.O. Box* 809, *Johannesburg, S. Africa.*
1909		Ghosh, Devendra Nath., B.A., F.R.E.S., Rai Sahib, 26, *Nyan Chund, Dutt-street, Beaden-square, P.O., Calcutta.*
1914		Ghosh, Mammathanath, M.A., 90, *Shambazar-street, Calcutta, India.*
1885		Gibb, Sir George S., *By Cæsar's Camp, Wimbledon Common, S.W.*
1900	*c d p*	Gladwell, Sydney W., 82, *Victoria-street, S.W.*
1860	*d*	Glover, Sir John, J.P., *Highgate Lodge, West-hill, Highgate, N.*
1901		Godfrey, Ernest H., *Census and Statistics Office, Dept. of Trade and Commerce, Ottawa, Canada.*
1910		Goldman, C. S., M.P., *Salisbury House, E.C.*
1903	*d p*	Goldman, Leopold, A.I.A., F.C.A., *N. American Life Assurance Co.*, 112–118, *King-st. West, Toronto.*
1884		*Gonner, Professor Edward C. K., M.A., *University College, Liverpool.*
1901		*Gooch, Henry C., 17, *Oxford-square, W.*
1911	*d*	Goodship, Harold E., *Uganda State Rly., Nairobi, British E. Africa.*
1900		Goodsir, George, *c/o Messrs. Weddel & Co.*, 16, *St. Helen's-pl., E.C.*
1892		Goodwin, Alfred, M.A., 2, *Charles-road, St. Leonards, Sussex.*
1911		Gough, The Right Hon. Viscount, K.C.V.O., 9, *Upper Belgrave-street, S.W.*
1893		*Gray, The Hon. James McL., M.A., F.R.G.S., *c/o R. Todd*, 1, *York-buildings, Adelphi, W.C.*
1895	*d*	Green, John L., 2, *Belmont-park, Lee, S.E.*
1902		Green, Walford D., M.A., *Huntley, Bishop's Teignton, S. Devon.*
1914		Greenwell, Hubert, 30–31, *Furnival-street, Holborn, E.C.*
1912		Greenwood, Arthur, B.Sc., *Nunscroft, Ayresome-terrace, Roundhay, Leeds.*

Year of Election.		
1909	c d p	*GREENWOOD, MAJOR, M.R.C.S., L.R.C.P., *"Hillcrest," Church Hill, Loughton, Essex.*
1895		Gretton, John, M.P., *Stapleford Park, Melton-Mowbray.*
1911		Griffin, George Herbert, 24, *Essex-street, Strand, W.C.*
1911		Griffin, Harry Hewitt, M.J.I., *St. Oswald's, Putney, S.W., and Guildhall, E.C.*
1914		Grisewood, H. J., *The Prebendal, Thame, Oxon.*
1905		Gubbay, M. M. Simeon, B.A.
1910		Gupta, Saratkumar Dutta, M.A., *Jainshar, P.O., Dacca, Bengal, India*
1878		Guthrie, Charles, *Moscow Mansions*, 224, *Cromwell-road, South Kensington, S.W.*
1880		*Gwynne, James E. A., J.P., F.S.A., *Folkington Manor, Polegate, Sussex.*
1887		Gwyther, John H., 13, *Lancaster-gate, W.*
1892	d	Hadfield, Sir Robert A., F.R.S., *Parkhead House, Sheffield.*
1873	d	*Haggard, Frederick T., 1, *Broadwater Down, Tunbridge Wells.*
1903		*Haig, Edric W., M.A., LL.M., *Gatehampton, Goring, Oxon.*
1887		Haldeman, Donald C., *The Rookery, Downe, Kent.*
1912		Hall, Professor F., M.A., B.Com., *"Grasmere," Lansdowne-road, Belfast.*
1897	d	Hall, Thomas, *Railway Commissioners' Offices, Sydney, N.S.W.*
1878		Hallett, Thomas G. P., M.A., *Claverton Lodge, Bath.*
1894		*Hambleden, The Right Hon. Viscount, M.P. 3, *Grosvenor-place, S.W.*
1911	c	HAMER, WILLIAM HEATON, M.D., F.R.C.P., 55, *Dartmouth Park-hill, N.W.*
1873	c d p	HAMILTON, THE RT. HON. LD. GEORGE F., G.C.S.I. (*Hon. Vice-President*), 17, *Montagu-street, Portman-square, W.*

Year of Election.		
1913		Hamilton, William Robert, *Armitage Chambers, Victoria-street, Nottingham.*
1881		*Hammersley, Hugh G., *The Grove, Hampstead, N.W.*
1910	*d*	Hammond, H. Pierson, *Connecticut Insurance Dept., Hartford, Conn., U.S.A.*
1875		Hankey, Ernest A., *Notton, Lacock, Chippenham.*
1906		Hannon, Patrick J. H., *The Navy League,* 11, *Victoria-street, S.W.*
1886		*Hardcastle, Basil W., 10, *Gainsborough-gardens, Hampstead, N.W.*
1912		Harper, C. J. S., 10 *and* 12, *Bishopsgate, E.C.*
1901	*c d p*	Harper, Edgar J., *Beech Hurst, Haling Park-road, Croydon.*
1906		*Harper, Robarts, F.R.G.S.,
1893		Harrap, Thomas, 230, *Stamford-street, Ashton-under-Lyne, Lancs.*
1897		Harris, Walter F., F.I.C.A., 13, *Westbourne-avenue, Hull.*
1909		Harrison, C. W. Francis, F.R.G.S., *c/o The Hon. Joseph Baynes, C.M.G., Nel's Rust, Natal.*
1913		Hart, Charles, 11, *Duke's-avenue, Muswell Hill, N.*
1900	*p*	Hartley, Edwin L., B.A., 1, *Paper-buildings, Temple, E.C.*
1911		Hatch, Sir Ernest F. G., Bart., 20, *Portland-place, W.*
1896		Hawkins, Willoughby R., *Bute Docks, Cardiff.*
1912		Hawtrey, R. G., 104, *Beaufort-mansions, Chelsea, S.W.*
1897		Hayakawa, S., 69, *Nagatacho-Nichome, Tokio, Japan.*
1895	*d*	Haynes, Thomas H., 17, *Denmark-avenue, Wimbledon.*
1913	*p*	Hazell, Walter, J.P., 82, *Bedford-avenue, Bedford-square, W.C.*
1909		Heath, John St. George C., *The Warden's Lodge, Toynbee Hall,* 28, *Commercial-street, E.*
1911		*Heaton, The Rev. Harold Hjalmar, M.A., 111, *Balfour-road, Ilford.*
1896		*Heaton-Armstrong, William C., J.P., 5, *Cornwall-gardens, S.W.*
1912		Heimbrod, G., *Lautoka, Fiji.*
1908		Heinicke, Fedor, *c/o The Forestal, Ltd. (Box Office) Cassila Correo,* 1167, *Buenos Ayres, Argentina.*

Year of Election.		
1889		*Hemming, Arthur G., F.I.A., *London Assurance Corporation, 7, Royal Exchange, E.C.*
1906	*d*	Heron, David, M.A., D.Sc., *Galton Eugenics Laboratory, University College, Gower-street, W.C.*
1911		Hicks, John Cranfield, *Elmwood, Buckhurst-hill, Essex.*
1892	*c d p*	*Higgs, Henry, LL.B., C.B., *Ministry of Finance, Cairo, Egypt.*
1911		Higham, John Sharp, M.P., 25, *Mosley-street, Manchester.*
1912		Higman, J. C., *Thorneycroft, Bridgend.*
1900		Hillingdon, The Right Hon. Lord, 67, *Lombard-street, E.C.*
1910	*d*	Hinckes, Ralph T., 3, *Wilton-terrace, Belgrave-square, S.W.*
1910		Hirst, Francis Wrigley, 3, *Arundel-street, Strand, W.C.*
1913		Hirst, Hugo, 67, *Queen Victoria-street, E.C.*
1903		Hiscock, Elias J., 51, *Sotheby-road, Highbury, N.*
1909		*Hobson, Charles Kenneth, *The Gables, Mount Pleasant, Cambridge.*
1904		Hobson, John A., 3, *Gayton-crescent, Hampstead, N.W.*
1908	*d*	Hoffman, Frederick L., *Prudential Insurance Co., Newark, N.J., U.S.A.*
1912	*d*	Hofmeyr, P. J. H., *Office of the Public Service Commission, Union Buildings, Pretoria.*
1895		Holland, Hon. Lionel R., 75, *Eaton-square, S.W.*
1898		Holland, Robert M., C.B., 68, *Lombard-street, E.C.*
1901		Holmes, Richard H., J.P. (Alderman), 10, *Royal Arcade, Newcastle-on-Tyne.*
1913		Hoogewerf, E., A.M.S.T., *Government Weaving Institute, Serampore, Bengal, India.*
1895	*d p*	*Hooker, R. H., M.A., 3, *Holywell-hill, St. Albans.*
1913		Hooper, Alfred Albert Edward, 37, *Effingham-road, Bristol.*
1906	*d*	Hooper, Frederick, *Board of Trade, 73, Basinghall-street, E.C.*
1879		Hooper, George N., *Elmleigh, Hayne-road, Beckenham, Kent.*
1903	*d*	Hooper, William G., F.R.A.S., 40, *Portland-road, Edgbaston, Birmingham.*
1878	*c d p*	Hooper, Wynnard, 13, *Sumner-place, Onslow-square, S.W.*

Year of Election.		
1910		Hope, E. W., M.D., L.R.C.P., *Public Health Dept. Municipal Offices, Liverpool.*
1887		Hopkins, John, *Little Boundes, Southborough, Kent.*
1899	*d*	Hopkins, J. Castell, *c/o The Annual Review Publishing Co., 2, College-street, Toronto.*
1912		Hopkins, William, *112, Wallwood-road, Leytonstone, N.E.*
1909	*d*	Hore, C. F. Adair, *National Health Insurance Commission, Buckingham-gate, S.W.*
1913		Horwitz, Israel, *139 Whitechapel-road, E.*
1910	*d*	*Howard, Henry Fraser, C.I.E., *Bengal Club, Calcutta, India.*
1883		Howell, Francis B., *Ethy, Lostwithiel, Cornwall.*
1897	*p*	Howell, Price, *Killara, near Sydney, N.S.W.*
1913		Hughes, T. Herbert, *The "White House," Barnard-road, Leigh Park, Leigh-on-Sea.*
1874	*c d p*	Humphreys, Noel A., I.S.O., *"Woodstock," St. George's-road, Worthing.*
1903		Hunt, Arthur L., *"Bryn," Somerville-road, Sutton Coldfield.*
1888		Hunter, Alderman G. B., D.Sc., *Wallsend-on-Tyne.*
1910		Hurst, Thomas J. P., *Port of London Authority, 23, Crutched Friars, E.C.*
1902	*d p*	Hutchins, Miss B. L., *The Glade, Branch-hill, Hampstead-heath, N.W.*
1912	*p*	Hutchinson, Professor Lincoln, *University of California, Berkeley, California, U.S.A.*
1888		Hyde, Sir Clarendon G., *Longworth House, Berks.*
1901		Hyde, Hugh V., *Board of Agriculture and Fisheries, 3, St. James's-square, S.W.*
1893	*d*	Hyde, Hon. John, F.R.G.S., F.S.A. Scot., *Lanier Heights, Washington, D.C., U.S.A.*
1903	*d p*	Hythe, The Rt. Hon. Viscount, *Park Gate, Battle.*

Year of Election		
1887		Irvine, S. W. D'Arcy, J.P., *Equitable Life Assurance Soc. of U.S.A., c/o Morning Post Building, 346, Strand, W.C.*
1913		Iyer, M. R. Sundaram, *Madras Economic Association, Madras, India.*
1910		Jack, Henry J., *"Heathfield," 357, Clapham-road, S.W.*
1912		Jacob, S. M., *6, Shire-croft, Otford, Kent.*
1902		Jagger, John W., *Cape Town.*
1906		James, A. F. Brodie, *Gresham House, Old Broad-street, E.C.*
1894	*d*	Jamieson, George, C.M.G., *180, St. James's-court, Buckingham Gate, S.W.*
1908		Janisch, Noel, C.M.G., *Colonial Secretary's Office, Cape Town, S. Africa.*
1897	*c d*	JAY, E. A. HASTINGS, M.A., LL.B., *Tower House, Woolwich.*
1881		*Jersey, The Right Hon. the Earl of, G.C.B., *Osterley-park, Isleworth.*
1907	*d p*	*Jevons, H. Stanley, M.A., B.Sc., *3, Pembroke Terrace, Cardiff.*
1881		Johnson, E. Eltham, *110, Cannon-street, E.C.*
1910		Johnson, E. Stewart, *The Hospital for Sick Children, Great Ormond-street, W.C.*
1911		Joicey, The Rt. Hon. Lord, *Ford Castle, Cornhill-on-Tweed.*
1911		*Jones, David C., *The University, Durham.*
1914		Jones, David T., *The Scottish Fishery Board, Edinburgh.*
1913		Jones, Ernest Stephens, A.I.A., *19, Old Jewry, E.C.*
1905		Jones, John H., *Political Economy Department, University, Glasgow.*
1888	*d*	*Jordan, William L., *Royal Societies Club, St. James's-street, S.W.*
1889		Justican, Edwin, F.I.A., *Royal Societies Club, St. James's-street, S.W.*

Year of Election		
1914		Kahn Augustus, M.A., 25, *Fairhazel-gardens, South Hampstead, N.W.*
1910		†Kahn. Stephane, F.R.G.S., 4. *Sloane Court, S.W.*
1902		Kains-Jackson, Charles P. C., 10, *The Green, Richmond.*
1911		Keeling, Frederick Hillersdon, 21, *Old-buildings, Lincoln's-inn*, W.C.
1885		Keen, William B., 23, *Queen Victoria-street. E.C.*
1884		Kelly. Edward F., 182—184, *High Holborn, W.C.*
1883	*e d*	Keltie, John Scott, F.R.G.S., LL.D., 10, *Albemarle Mansions, Heath-drive, Finchley-road, N.W.*
1878		Kennedy, J. Murray, *New University Club, St. James's-street, S.W.*
1898		Kent, Arthur C., 176, *Victoria-street, S.W.*
1899		Kershaw, John B. C., F.I.C., *West Lancs. Laboratory, Waterloo, Liverpool.*
1905		Keshishian, Agazar, 99, *John-street, New York, U.S.A.*
1909		Kettle, Bernard, *Guildhall, E.C. (Representing the Library Committee of the Corporation of the City of London).*
1909	*d*	Keynes, John M., M.A., *King's College, Cambridge.*
1883	*d*	†Keynes, John N., M.A., D.Sc., 6, *Harvey-road, Cambridge.*
1906		Khras, Minocher J. S., *Khras Bungalow, Middle Colaba, Bombay.*
1884		Kimber, Sir Henry, Bart., M.P., 79, *Lombard-street, E.C.*
1898	*c d*	*KING, A. W. WATERLOW, J.P., *Orchard House, Gt. Smith-st., Westminster, S.W.*
1883	*p*	†King, Bolton, M.A., *Arden Lodge, Warwick.*
1911		Kinnear, Walter S., B.A., *Royal Exchange Assur.*, 5, *College Green, Dublin.*
1891		*Kirkcaldy, William M., *Dunedin, Otago, New Zealand.*

Year of Election:		
1913		Kitchin, Joseph. *"Ingleneuk," Brackley-road, Beckenham, Kent.*
1889		Kloetgen, W. J. H., 20—21, *Lawrence-lane, E.C.*
1906	*d*	Knibbs, George H., C.M.G., *Commonwealth Statistician, Melbourne, Victoria.*
1913		Kolthammer, F. W., M.A., 70, *Lonsdale-road, Oxford.*
1913		Koren, John, 491, *Boylston-st., Boston, Massachusetts, U.S.A.*
1878	*d*	*Kusaka, Yoshio, *First National Bank, Tokio, Japan.*
1901	*d*	Lakin-Smith, Herbert, F.C.A., 26, *Waterloo-street, Birmingham.*
1902	*p*	Lark, Albert E., F.C.A., *Hall Quay Chambers*, 2, *South Quay, Great Yarmouth.*
1885	*d*	Latham, Baldwin, M.Inst.C.E., *Parliament-mansions, Victoria-street, S.W.*
1910	*d*	Laughton, A. M., *Government Statist, Melbourne, Victoria.*
1912		Lavington, Frederick. 31, *Well-walk, Hampstead, N.W.*
1897	*d*	*Lawrence, Frederick W., M.A., 87, *Clement's-inn, W.C.*
1890	*d*	Lawson, William R., *Finchley Lodge, North Finchley, N.*
1908		Layton, Walter T., *The Milestone, Hills-road, Cambridge.*
1905	*d*	*Leake, Percy D., 25, *Abchurch-lane, E.C.*
1911		Leask, Peter, M.A., *"Draxmont," Albert-road, Wimbledon, S.W.*
1910		Lee-Nash, Walter, *The Office of Woods*, 1, *Whitehall, S.W.*
1887		*Leitch, Alexander (*Scottish Provident Institution*). 3, *Lombard-street, E.C.*
1907		Lempfert, R. G. K., M.A., 66, *Sydney-street, Chelsea, S.W.*
1892		Leon, Sir Herbert S., Bart., *Bletchley-park, Bletchley, Bucks.*
1888		*Le Poer-Trench, Col. The Hon. W., R.E., J.P., *St. Hubert's, Gerrard's-cross, R.S.O., Bucks.*

Year of Election.		
1887		*Le Roy-Lewis, Colonel Herman, C.B., D.S.O., *Westbury House, Petersfield, Hants.*
1910		*Leslie, Professor, *South African College, Capetown, South Africa.*
1899		L'Estrange, Charles J.,
1908		*Lever, Sir William H., Bart., *The Hill, Hampstead Heath, N.W.*
1903	*d*	Levy, Professor Hermann, *Kussmaulstr.* 10, *Heidelberg, Germany.*
1912		Levy, Raphael G., 3, *Rue de Noisiel, Paris.*
1908		Lewis, Hugh (*L'pool, London & Globe Insurance Co.*), 1, *Cornhill, E.C.*
1862	*d*	Lewis, Robert, 1, *Bartholomew-lane, E.C.*
1888		*Liberty, Sir Arthur L., *The Manor House, The Lee, near Gt. Missenden.*
1914		Lightfoot, Gerald, *Commonwealth Bureau of Census and Statistics, Melbourne, Victoria, Australia.*
1911		Likeman, William C., *Blue Coat School, Reading.*
1902	*d*	Litchfield, Frederick, 96, *Hampstead Way, Hendon, N.W.*
1898		Litkie, Valerian A., 39, *South-street, W.*
1892		Llewelyn, Sir John T. D., Bart., *Penllergaer, Swansea.*
1903		*Lloyd, Godfrey I. H., *The University of Toronto, Canada.*
1913		Loban, Gustavus Taylor, *Devonshire Club, St. James's-street, S.W.*
1888	*c d p*	LOCH, PROFESSOR CHARLES S., D.C.L., *Drylaw Cottage, Little Bookham, Surrey.*
1882	*c d p*	*Longstaff, George B., M.A., M.D., F.R.C.P., *Highlands, Putney Heath, S.W.*
1907	*d*	Lord, Samuel, A.S.A.A., 18, *Lynton-road, Acton, W.*
1876		*Lornie, John G., J.P. (*of Birnam & Pitcastle*), *Rosemount, Kirkcaldy, N.B.*
1886		*Low, Malcolm, 22, *Roland-gardens, S.W.*
1909		*Lubbock, The Hon. Harold Fox Pitt, *High Elms, Orpington, Kent.*
1912		Lucas, The Right Hon. Lord, 32, *Old Queen-street, S.W.*
1904	*d*	Lutterveld, Willem M. J. van, *Bloemendaal près de Haarlem, Holland.*

Year of Election.		
1875		*Mabson, Richard R., *"Statist" Office, 51, Cannon-street, E.C.*
1894	*d*	Macaulay, Thomas B., *Sun Life Assurance Co., Montreal, Canada.*
1888		McCankie, James, *51, Frederick-street, Edinburgh.*
1903		MacConochie, William P., *Woodbank, Woodville-road, New Barnet.*
1902		Macdonald, John H., *47, Parliament-street, Westminster, S.W.*
1898		*Macdonald, Robert A., C.A. *4, Carlton-street, Edinburgh.*
1912	*p*	Macdonald, R. A., M.A., *22, Princes-avenue, Great Crosby, Liverpool.*
1872	*c d p*	Macdonell, Sir John, K.C.B., LL.D., *Room 183, Royal Courts of Justice, W.C.*
1873		*McEwen, Laurence T.,
1912		Macfarlane, H *Baysgarth, Eastbury-road, Northwood.*
1913		Machin, Stanley, *16, Eastcheap, E.C.*
1886		*Mackenzie, Colin, F.R.G.S.,
1876		*McLean, Robert A., F.R.G.S., *1, Queen Victoria-street, E.C.*
1913		Macready, W. R., *11, Lombard-street, E.C.*
1904		Macrosty, Henry W., B.A., *29, Hervey-road, Blackheath, S.E.*
1899		*MacWharrie, Niel M.,
1906	*d*	Magnus, Sir Philip, M.P., *16, Gloucester-terrace, Hyde Park, W.*
1891		Maidment, Thomas, *Insurance Chambers, King's-road, Southsea.*
1910	*d*	Malachowski, N. J., *Witebskaia Ulica, 15, St. Petersburg, Russia.*
1904	*c d p*	**MALLET, BERNARD**, C.B., *General Register Office, Somerset House, W.C.*

Year of Election.		
1902	*d*	Mandello, Professor Julius G., Ph.D., *1, Tabor-utca. 2, Budapest, Hungary.*
1908		Manohar Lāl, Professor, M.A., *Barrister-at-Law, Lahore, India.*
1884		*Manson, Frederick W., *Faircrouch, Wadhurst, Sussex.*
1888		Manuel, James, *36, Vittoria-street, Ottawa, Canada.*
1880	*c d p*	*Marshall, Professor Alfred, M.A., *Balliol Croft, Madingley-road, Cambridge.*
1872	*c d p*	*MARTIN, SIR RICHARD BIDDULPH, BART. *(Hon. Vice-President and Treasurer),* *10, Hill-street, Mayfair, W.*
1911		Mason, James Francis, M.P., *Eynsham Hall, Witney, Oxon.*
1884		Mason, William A., *31a, Colmore-row, Birmingham.*
1898		Massingberd, Captain Stephen, *Gunby Hall, Burgh, Lincolnshire.*
1875		*Mathers, John S.,
1911		Maxwell, Arthur, *c/o Messrs. Glynn, Mills, Currie and Co., 67, Lombard-street, E.C.*
1910	*d*	Maynard, G. D., *P.O. Box* 1198, *Johannesburg.*
1910		Maynard, H. R., *Kingswood, Antrim-st., Haverstock-hill, N.W.*
1901	*d*	Meakin, George H., A.S.A.A., *Town Hall, Islington, N.*
1882		Medhurst, John T., F.S.A.A., *City of London College, Moorfields, E.C.*
1901		Meredith, Hugh O.,
1884	*d*	Merton, Zachary, *Folly Farm, Sulhampstead, Reading.*
1907		Middleton, Professor Thomas H., C.B., M.A., 8, *Whitehall-place, S.W.*
1909		Millard, Percy W., LL.B., 3, *St. James's-square, S.W.*
1900		Miller, John W., *Union Club, S.W.*
1889		*Mills, Major Henry Farnsby,
1892	*c d*	Milner, The Rt. Hon. Viscount, G.C.B., G.C.M.G., 47, *Duke-street, S.W.*
1882	*p*	Milnes, Alfred, M.A., 44, *Goldhurst-terrace, S. Hampstead, N.W.*
1907		*Mitchell, Frederick W., F.R.G.S., *Star Assurance Soc., 32, Moorgate-st., E.C.*
1902	*d*	Molesworth, Sir Guilford L., K.C.I.E., *The Manor House, Bexley, Kent.*

Year of Election.		
1911		Monckton, H. Percy. 32, *Walbrook, E.C.*
1911		Mond, The Right Hon. Sir Alfred M., Bart., M.P., 35, *Lowndes-square, S.W.*
1911		Monkswell, The Right Hon. Lord, 117, *Prior's-house, St. James's Court, S.W.*
1899		*Moon, Edward R. P., 6, *Onslow Gardens, S.W.*
1887		Moore, Arthur C., 23, *Essex-street, Strand, W.C.*
1874		Moore, Charles R., 13, *Breakspears-road, St. Johns, S.E.*
1878		*Moore, John B. G., *Loymount, Cookstown, Ireland.*
1909	*d*	Morgan, Ben. H., 15, *Dartmouth-street, Westminster, S.W.*
1910		Morgan, H. Allan, *Holmwood, Knutsford, Cheshire.*
1893	*d*	Morgan, Percy C., *Queen Anne's Chambers, S.W.*
1902	*c*	Morison, Sir Theodore, K.C.I.E., M.A., *Old Acacia Lodge, Weybridge.*
1914		Morris, Edward Bontecou, *The Travelers' Insurance Co., Hartford, Connecticut, U.S.A.*
1911		Morrison, G. B., 28, *Victoria-road, Shoreham, Sussex.*
1891	*c d p*	Morrison, Rev. William D., LL.D., *The Rectory, Marylebone Chapel, Marylebone-road, N.W.*
1911		Mortara, Professor Giorgio, *Piazzale Flaminio* 9, *Rome, Italy.*
1885		*Mosley, Tonman, C.B., *Bangors, Iver, Uxbridge.*
1886	*c*	Mowbray, Sir Robert G. C., Bart., 90, *Piccadilly, W.*
1886	*d*	Moxon, Thomas B., *Lancs. and Yorks. Bank, King-st., Manchester.*
1904		Mudie-Smith, Richard, *Goathland, Rotherwick-road, Hampstead Garden Suburb, N.W.*
1899	*d*	Muirhead, James M. P., J.P., F.R.S.E., F.R.S.L., F.S.A.A., F.C.I.S., F.R.C.I., *c/o The Dunlop Rubber Co., Ltd.,* 3, *Wallace St., Fort, Bombay, India.*
1910		Mukherji, Pramatha Nath, M.A., 9, *St. James's-square, Calcutta, India.*
1905		Muller, Osvald V., M.A., *Elphinstone College, Bombay; and Newquay, Cornwall.*
1891	*c d*	MURPHY, SIR SHIRLEY F., F.R.C.S., (*Vice-President.*) 9, *Bentinck-terrace, Regent's-park, N.W.*

Year of Election.		
1913		Narayan, Lachmi, *Financier and Zamindar, Allahabad, India.*
1909		Nathan, Eric Burnett, F.I.A., 99, *Portsdown-road, W.*
1878		*Nathan, Henry,
1908		Neill, Samuel B., 13*a*, *Canton-road, Shanghai, China.*
1908		Neill, Thomas, *Oakwood, Southend-road, Beckenham, Kent.*
1869	*c d p*	Neison, Francis G. P., F.I.A., *The Hollies, Ringley-park, Reigate.*
1877		Nevill, C. Henry, 1 *and* 2, *Great Winchester-street, E.C.*
1905		Nevill, Henry R., *Allahabad, U.P., India.*
1912		Nevill, Louis B., *The Close, Norwich.*
1900		Newcomb, Harry T., LL.M., *Bethesda, Montgomery County, Md., U.S.A.*
1889	*c d p*	Newsholme, Arthur, C.B., M.D., 112, *Ashley Gardens, S.W.*
1895		†Nicholson, Sir Charles N., Bart., M.P., 35, *Harrington-gardens, South Kensington, S.W.*
1878	*d p*	Nicholson, Professor J. Shield, M.A., D.Sc., F.B.A., *University of Edinburgh.*
1913	*d*	†Nixon, James William, B.Sc., *Central Office for Unemployed Insurance, Queen Anne's Chambers, S.W.*
1871		†Noble, Benjamin, F.R.A.S., *Westmorland House, Low Fell, Gateshead.*
1912		Norman, Frank A., 8, *Park-road, Wimbledon, S.W.*
1901		Offen, Charles R. W., *Bloomsbury House, Cartwright-gardens, W.C.*
1912		O'Hara, F. C. T., *Department of Trade and Commerce, Ottawa, Canada.*

Year of Election.		
1911		*Oke, Alfred William, B.A., L.L.M., F.S.A., *33, The Avenue, Southampton.*
1885	*d*	*Oldham, John (*River Plate Telegraph Co.*), *287, San Martin, Buenos Ayres.*
1909		O'Malley, L. S. S., I.C.S., *Longridge, Pyrford, Surrey.*
1887	*d*	*Page, Edward D., *Oakland, Bergen County, N.J., U.S.A.*
1899	*c d p*	Paish, Sir George, "*Statist*" *Office*, 51, *Cannon-street, E.C.*
1866	*c d p*	*Palgrave, Sir R. H. Inglis, F.R.S., *Henstead Hall, Wrentham, Suffolk.*
1912		Palmer, Truman G., 902, *Union Trust-buildings, Washington, D.C., U.S.A.*
1906		Parish, Walter Woodbine, 9, *Courtfield-road, S.W.*
1908		Parker, Charles Sandbach, *Demerara-buildings, St. Dunstan's-hill, E.C.*
1903		Parker, Sir Gilbert, M.P., 20, *Carlton House-terrace, S.W.*
1891		Parker-Smith, The Rt. Hon. James, *Linburn, Kirknewton, Midlothian.*
1883		Paterson, John, 1, *Walbrook, E.C.*
1914		Paterson, J. N., *c/o Messrs. Spillers and Bakers, Ltd.*, 19, *Brunswick-street, Liverpool.*
1912		Patrick, James, *Town Hall, Sunderland.*
1888		Pattullo, James Durie, 65, *London Wall, E.C.*
1878	*d*	Paulin, Sir David, 6, *Forres-street, Edinburgh.*
1893	*d*	Payne, Alexander W., F.C.A., 70, *Finsbury-pavement, E.C.*
1884		*Peace, Sir Walter, K.C.M.G., I.S.O., 83, *Victoria-street, Westminster, S.W.*
1910		Peacock, Walter, M.V.O., 3, *Buckingham-gate, S.W.*
1910		Peake, Edward Gordon, 98, *James-street, Dublin.*

Year of Election.		
1909		Pearce, A. James, A.C.A., *Corn Exchange Chambers, Princes-st., Ipswich.*
1914		Pease, Arthur Francis, J.P., D.L., *Middleton Lodge, Middleton Tyas, Yorks.*
1913		Peddie, John Taylor, 53, *Carlisle Mansions, Westminster, S.W.*
1895		Peixotto, M. Percy (*U.S. Equitable Life Office*), 23, *rue de la Paix, Paris.*
1903		Pekelharing, Dr. G., 11, *Zeemansstraat, Rotterdam.*
1891	*d*	Penn-Lewis, William, *"Cartref," Toller-road, Leicester.*
1892		*Pentland, The Right Hon. Lord, *Government House, Madras.*
1911		Pepper, James, *Silverdale, Palmerston-road, Derby.*
1906		Perkins, Herbert H. W., *Bolton-chambers, Eastbourne.*
1890		Peters, John W., 5, *King's-road, Southsea.*
1886		Peto, Sir Henry, Bart., M.A., *Chedington Court, Misterton, Crewkerne.*
1887	*d*	Phelps, Lieut.-General Arthur, 23, *Augustus-road, Edgbaston, Birmingham.*
1908	*d*	Phelps, E. Bunnell, M.A., "*The American Underwriter*," 500, *West 122d-street, New York City, U.S.A.*
1886	*d*	*Phelps, Rev. Lancelot R., M.A., *Oriel College, Oxford.*
1912		Phillips, John, F.R.C.I., 28, *Cambridge-road, Hove, Brighton.*
1900	*d*	*Pigou, Professor Arthur C., M.A., *King's College, Cambridge.*
1914		Pilling, Albert Bamford, *Corner House, Sutton, Surrey.*
1904		Pilling, John A. (*c/o Messrs. Deloitte and Co.*), *Florida 77, Buenos Ayres.*
1878	*d*	*Pim, Joseph Todhunter, *Rinnamara, Monkstown, Co. Dublin.*
1903		Pirrie, The Right Hon. Lord, K.P., LL.D., *Downshire House, Belgrave-square, S.W.*
1881		Planck, Deputy Surgeon-General Charles, M.R.C.S., *Lyden Croft, Edenbridge, Kent.*
1902		Plant, Alfred T., *Accountant's Office, G.W.R., Paddington, W.*
1901		Plender, Sir William (*c/o Messrs. Deloitte and Co.*), 5, *London Wall-buildings, Finsbury-circus, E.C.*
1896	*c d*	*Pontifex, Bryan, A.C.A., *Imperial Bank-buildings, Toronto, Canada.*
1891		Potter, Henry, *Normanhurst, Grosvenor-rd., Westcliffe-on-Sea, Essex.*

Year of Election.		
1913		Pownall, George Henry, *Moorside, Cherry Garden-avenue, Folkestone.*
1867		*Pratt, Robert L., 13, *Danesbury-terrace, Darlington.*
1896		Pretyman, Captain Ernest G., M.P., *Orwell-park, Ipswich.*
1887	*c d p*	*Price, L. L., M.A., *Oriel College, Oxford.*
1877	*c d p*	Price-Williams, Richard, *"Wildbury," St. Swithin's-road, Bournemouth.*
1909		Pritchard, Arthur, M.A., 3, *Temple-gardens, Temple, E.C.*
1887	*c d p*	PROBYN, SIR LESLEY, K.C.V.O. (*Vice-President*), 79, *Onslow-square, S.W.*
1889		Probyn, Lieut.-Colonel Clifford, 55, *Grosvenor-street, Grosvenor-square, W.*
1886	*d*	Provand, Andrew D., 105, *Pall Mall, S.W.*
1896		Pryor, Edward T., 23, *Fore-street, E.C.*
1911		Pullar, James, F.F.A., A.I.A., *Colonial Mutual Life Assurance Society, Ltd.*, 419, *Collins-street, Melbourne, Australia*

1901		Quin, Stewart B., F.C.A., 25, *Wellington-place, Belfast.*

1883		Rabbidge, Richard, F.C.A., 32, *Poultry, E.C.*
1872	*d p*	*Rabino, Joseph, 33, *St. George's-road, Eccleston-square, S.W.*
1885	*c d*	Rae, John, M.A., 1, *Rockland-road, Putney, S.W.*

Year of Election		
1887	*d p*	Raffalovich, His Excellency Arthur, 19, *Avenue Hoche, Paris.*
1912		Ramsay, John M., 29, *St. Andrew-square, Edinburgh.*
1880	*c*	Rankin, Sir James, Bart., M.P., *Bryngwyn, Hereford.*
1897		Ranson, Albert, *Tavern-street, Ipswich.*
1903	*d*	Rathbone, Miss Eleanor F., *Green Bank, Liverpool, E.*
1877		*Rawlins, Thomas, 45, *King William-street, E.C.*
1910	*d*	Rea, Peter Mackenzie, *Merton House, Salisbury-sq., Fleet-street, E.C.*
1913		Read, Albert Stanley, 101, *Richmond-road, Hackney, N.E.*
1908		Reade, Herbert Vincent, C.B., 32, *Palace Gardens-terrace, Kensington, W.*
1889		*Reed, Thomas, F.C.A., 63, *King-street, South Shields.*
1888	*c d p*	REW, R. HENRY, C.B. (*Vice-President*) (*Hon. and Hon. Foreign Sec.*), 14, *Embankment-gardens, S.W.*
1895		Richards, Roger C., *Cader House, Foxley-lane, Purley.*
1909		Ridley, Rt. Hon. Viscount, 10, *Carlton House-terrace, S.W.*
1914		Rietz, Henry Lewis, Ph.D., *University of Illinois, Urbana, Illinois, U.S.A.*
1913		Riley, Ernest, 17, *Wray-crescent, Tollington Park, N.*
1914		Robertson, J. A., *Little Wittenham, Abingdon, Berks.*
1900		Robinson, James, 10, *Alma-place, North Shields.*
1912		Rockliff, Percy, 108–114, *City-road, E.C.*
1873	*c*	†Rosebery, The Rt. Hon. the Earl of, K.G., K.T., F.R.S., 38, *Berkeley-square, W.*
1904	*c d p*	ROSENBAUM, SIMON, M.Sc., 94, *Barrow Gate-road, Chiswick, W.*
1892	*d*	Ross, C. Edmonstone, F.S.A.A., *c/o Messrs. Thos. Cook and Son, Ludgate Circus, E.C.*
1911		Rowallan, The Rt. Hon. Lord, *Rowallan, Kilmarnock, and* 26, *Hans-place, S.W.*
1899	*d*	Rowntree, B. Seebohm, 32, *St. Mary's, York & The Homestead, Clifton, York*
1898	*d p*	Rozenraad, Cornelius, 4, *Moreton-gardens, South Kensington, S.W.*
1913		Ruddle, Frederick C., F.S.I., 43, *Wentworth-road, Hendon, N.W.*

Year of Election.		
1890		Ruffer, Marc A., C.M.G., M.A., M.D., B.Sc. *Ramleh, Egypt.*
1888	d	Rusher, Edward A., F.I.A., 142, *Holborn Bars, E.C.*
1886		Russell, Arthur B., F.C.A., *Marlborough House*, 11, *Ludgate-hill, E.C.*
1907	d	Rutter, Frank R., Ph.D., *Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D.C., U.S.A.*
1907		Rye, Reginald A., *Goldsmiths' Librarian, University of London, South Kensington, S.W.*
1913		Sabel, Paul, *Raadhuisstraat, Amsterdam, Holland.*
1909	d p	*Sale, Charles V., 21, *Old Broad-street, E.C.*
1914		Salmon, Herbert Cecil, 13, *Midmoor-road, Wimbledon, S.W.*
1875	d	*Salomons, Sir David L., Bart., J.P., *Broom-hill, Tunbridge Wells.*
1908	d	Samuel, George A. H., *Abinger Cottage, Aldersmead-road, New Beckenham, Kent.*
1899	d	Sanderson, Frank, M.A., *Canada Life Ass. Co., Toronto, Canada.*
1895	c	SANGER, CHARLES P., M.A., 58, *Oakley-street, Chelsea, S.W.*
1891		*Sarda, Pandit Har Bilas, B.A., M.R.A.S., *Government College, Ajmere, India.*
1886	d p	Sauerbeck, Augustus, *Champion Hill House, Champion-hill, S.E.*
1887		*Scarth, Leveson, M.A., 84, *Oakwood-court, Kensington, W.*
1908	d	Schmidt, Arno, 22, *St. Mary's-gate, Manchester.*
1895		Schmidt, Hermann, 36A, *Ampthill-square, N.W.*
1891	d p	Schooling, J. Holt, 19, *Linton-road, Hastings.*
1908		Schumpeter, Dr. Joseph A., *University of Graz, Graz, Austria.*
1895	d	Schuurman, Willem H. A. Elink, *Godelindeweg*, 10, *Hilversum, Holland.*

Year of Election.		
1883		*Schwann, John F., *Oakfield, Wimbledon, S.W.*
1880		*Seeley, Sir Charles, Bart., *Sherwood Lodge, Nottingham.*
1911		Sen, Nirmalsankar, M.A., *Serampore, E.I.R., Bengal.*
1899		Setchfield, George B., *Beulah Kop*, 3, *Clarkson-street, Sheffield.*
1886	d p	Seyd, Ernest J. F., *Cider Mill Hatch, Newdigate, Surrey.*
1905	d	Seyd, Richard E. N. J., 38, *Lombard-street, E.C.*
1914		Shackel, Thomas W., *Bureau of Statistics, Brisbane, Queensland.*
1909		Sharp, Clifford Dyce, *Woodside Corner, Erskine-hill, Hendon, N.W.*
1898	c d p	SHAW, WILLIAM N., D.Sc., F.R.S., 10, *Moreton-gardens, South Kensington, S.W.*
1907		Sheffield, The Right Hon. Lord, 18, *Mansfield-street, W.*
1912	d	Sheppard, W. F., Sc.D., *Braybrooke, Worcester-road, Sutton, Surrey.*
1898	d	Sherwell, Arthur, 106, *Bedford-avenue, W.C.*
1888		Shillcock, Joshua, M.A., *Bank of England, Burlington-gardens, W.*
1907		Shimmell, James E., A.I.A., *c/o British Legal Life Assurance Co., Ltd.*, 78, *New Oxford-street, W.*
1911		*Shirras, G. Findlay, M.A., *United Service Club, Chowringhee, Calcutta, India.*
1913		Shove, Gerald Frank, B.A., 38, *Brunswick-square, W.C.*
1907	d	Simon, André L., 24, *Mark-lane, E.C.*
1902		Sinclair, H. D., 19 *and* 20, *Silver-street, Wood-street, E.C.*
1910		Slough, William Henry, 28, *Claverley-grove, Church End, Finchley, N.*
1906		Smith, Charles, 11, *Winter-street, Sheffield*
1878	d	*Smith, George, LL.D., C.I.E., 10, *South Learmonth-gardens, Edinburgh.*
1889	d	Smith, G. Armitage, M.A., D.Sc., 3, *Albert-terrace, Regent's-park, N.W*
1904		*Smith, H. B. Lees, M.A., M.P., *Latimer House, Church-street, Chiswick, W.*
1906		Smith, Horace A., *Bureau of Statistics, Sydney, N.S.W.*
1888	c d	Smith, Sir H. Llewellyn, K.C.B., B.Sc., *Oakfield Lodge, Ashtead.*

Year of Election.			
1901			Smith, Robert J., C.A., 163, *West George-street, Glasgow*
1905			Smith, Stanley George, A.C.A., 19, *Grosvenor-road, Muswell-hill, N.*
1908		*d*	Smith, William H., F.S.A.A., "*Belmont,*" *Ferriby-road, Hessle, E. Yorks.*
1894			Smithers, Frederick O., 171, *Adelaide-road, South Hampstead, N.W.*
1910		*d p*	Snow, Ernest Charles, M.A., D.Sc., *Sir John Cass's Institute, Jewry-street, E.C.*
1900	*c*	*p*	*Somerville, Professor William, M.A., D.Sc., 121, *Banbury-road, Oxford.*
1914			Soper, Herbert Edward, 8, *Causton-road, Highgate, N.*
1899			Sorley, James, F.I.A., F.F.A., F.R.S.E., 82, *Onslow-gardens, S.W.*
1904			Souter, John, *Box* 301, *Bloemfontein.*
1881			Southwark, The Rt. Hon. Lord, 12, *Devonshire-place, Portland-place, W.*
1895			Soward, Alfred W., C.B., 28, *Therapia-road, Honor Oak, S.E.*
1855		*d*	Sowray, J. Russell, "*Fairlawn,*" *Teston, Maidstone.*
1904			Sowrey, John W., "*Beaconsfield,*" *Devonshire-road, Merton, S.W.*
1911			Spain, Frederick G. L., *Bassishaw House,* 70*a, Basinghall-street, E.C.*
1896			Sparrow, Frederick S., 84, *Pitt-street, Sydney, N.S.W.*
1906			Spear, Bertram E., 2, *Savoy-hill, Victoria Embankment, W.C.*
1904			Spencer, Frederick H., LL.B., 6, *Curzon-road, Prenton, Birkenhead.*
1867			*Spencer, Robert J.,
1892			Spender, John A., M.A., 45, *Sloane-street, S.W.*
1897		*d*	Spensley, J. Calvert, *The Chalcots, England's-lane, Hampstead, N.W.*
1911			Speyer, The Rt. Hon. Sir Edgar, Bart., 46, *Grosvenor-street, W.*
1883			Spicer, The Rt. Hon. Sir Albert, Bart., M.P., 50, *Upper Thames-street, E.C.*
1856		*d*	*Sprague, Thomas B., M.A., LL.D., F.I.A., 29, *Buckingham-terrace, Edinburgh.*
1901			Stallard, Charles F., *P.O. Box* 5156, *Johannesburg.*
1911			Stamp, Jos. C., B.Sc., 4, *Waldegrave-gardens, Strawberry Hill, Middlesex.*

Year of Election.		
1902		*Steel-Maitland, Arthur H. D. R., M.P., 72, *Cadogan-square, S.W.*
1899		Stenberg, Ernst G., *Chief Electoral Officer, W. Australia, Perth, W.A.*
1882		*Stern, Sir Edward D., 4, *Carlton House-terrace, S.W.*
1885	*d*	*Stevens, Marshall, *Trafford Park, Manchester.*
1903	*d*	Stevens, William J., *"St. Clair," Tyson-road, Forest Hill, S.E.*
1908	*c d p*	*STEVENSON, DR. T. H. C., *General Register Office, Somerset House, W.C.*
1911		Stiles, Clement R., *"Gonville," Clarendon-road, Wallington, Surrey.*
1906		*Stock, Edward J., A.I.A., 395, *Collins-st., Melbourne, Victoria, Australia.*
1912		Strauss, Regierungsrat Johann, *Director of the Statistical Dept., Serajevo, Bosnia.*
1913		Strong, Joseph, F.S.A.A., A.C.I.S., *Berkshire County Council, Shire Hall, Reading.*
1914		Subedar, Manu, B.A., B.Sc., *University of Bombay, Bombay, India.*
1884		*Sugden, Richard. *The Farre Close, Brighouse, Yorkshire.*
1900		Swetenham, Charles C., *c/o Grindlay Groom & Co., Bombay, India.*
1913		Tattersall, F. W., 9, *South-meade, Chorlton-cum-Hardy, Manchester.*
1889	*d*	Tattersall, William, *Melbrook, Bowdon, Cheshire.*
1888		*Taylor, Theodore Cooke, M.P., J.P., *Sunny Bank, Batley, Yorkshire.*
1905		Taylor, William B., B.A., LL.B., 112–118, *King-street West, Toronto.*
1893		Teece, Richard, F.I.A., F.F.A., *Actuary, A.M.P. Society, Sydney, N.S.W.*
1888	*d*	Temperley, William A., junr., 2, *St. Nicholas-buildings, Newcastle-on-Tyne.*
1888		Theobald, John W., 8, *Fairfield-road, Croydon.*

Year of Election.		
1888	*c d p*	THOMAS, DAVID A., M.A., *Llanwern, near Newport, Mon.*
1905		Thomas, P. Scofield, 220, *Croydon-road, Anerley, S.E.*
1864		*Thompson, Henry Y., 19, *Portman-square, W.*
1901	*d p*	Thompson, Robert J., *Board of Agriculture, &c.,* 8, *Whitehall-place, S.W.*
1912	*c d p*	*THOMPSON, SIR WILLIAM JOHN, M.D., 59, *Fitzwilliam-square, Dublin, Ireland.*
1909		Thomson, John W., F.F.A., A.I.A., *Hawarden, Cockenzie, N.B.*
1913		Thyagaraja Aiyar, V.R., *Officiating Deputy Commissioner, Chitaldrug, Mysore, India.*
1913	*d*	Tomlin, Francis Ferrier, F.S.I., F.A.I., 164, *Palmerston-road, Bowes Park, N.*
1889	*d*	Touche, George A., M.P., *Broomfield, Westcott, near Dorking.*
1911		Towler, William George, 2, *Bridge-street, Westminster, S.W.*
1913		Trachtenberg, H. L., B.A., A.I.A., 139, *Fordwych-road, Cricklewood, N.W.*
1911		Trachtenberg, Mendel Isidore, B.A., 2, *Somali-road, Brondesbury, N.W.*
1868		*Treatt, Frank B., *Court House, Cowra, New South Wales.*
1868		Tritton, Joseph H., 54, *Lombard-street, E.C.*
1903	*d*	Trivett, John B., *Bureau of Statistics, Sydney, N.S.W.*
1885		Turner, William, *c/o The Librarian,* *Free Public Library, Trinity-street, Cardiff.*
1909		Turnor, Christopher, *Panton Hall, Wragby, Lincolnshire.*
1892	*d*	Tyler, Edgar A., F.S.A.A., F.C.I.S., 9, *Old Jewry Chambers, E.C.*

1903	*d*	Unstead, John F., M.A., D.Sc., F.R.G.S., *The Bend, Florence-road, Sanderstead.*

Year of Election.			
1911			Vaidya Raman, G. A., B.A., 3, 4, *Sunkuramschetti Street, G.T., Madras, India.*
1903			*Vaizey, Ker G. R., *Lloyd's, London, E.C.*
1888			Van Raalte, Marcus, 22, *Austin Friars, E.C.*
1911			Varley, Benjamin, *The Laurels, Littleover, Derby.*
1912			Varney, G. T., *Elm Lodge*, 67, *Hillfield-road, West Hampstead.*
1889			*Venning, Charles H., *Local Govt. Mutual Guarantee Soc., Ltd.*, 10 & 12, *Ludgate-hill, E.C.*
1909		*p*	Verney, Harry, B.Sc., B.Comm. LL.B., 3, *Victoria Avenue, Church End, Finchley, N.*
1886	*c*		Verulam, The Right Hon. the Earl of, *Gorhambury, St. Albans.*
1905		*p*	*Vigor, Harold D., 196, *Mackenzie-road, Beckenham, Kent.*
1885			Vincent, Frederick J., A.I.A., *c/o Pearl Assurance Co., Ltd., High Holborn, W.C.*
1901			Vinter, James O., J.P., *Southfield, Trumpington, Cambs.*
1913			Vos, Philip, B.A., *Caius College, Cambridge.*

Year of Election.			
1902		*d*	Wacha Dinsha Edulji, *Jiji House, Ravelin Street, Hornby-road, Fort, Bombay.*
1901			Wagner, H. R., *Apartado* 792, *Mexico, D.F.*
1900			Walford, Adolphus A. B. (*Frank Brown & Co.*), *Finkle Chambers, Stockton-on-Tees.*
1890		*d*	Walford, Ernest L., 47, *Hamilton-terrace, N.W.*
1909			*Walker, James, F.C.R.A., 9, *Kennedy Drive, Partick, Glasgow.*

Year of Election		
1904	*d*	Wall, Walter W., 4, *Bradgate-road, Catford, S.E.*
1905		Wallis, B. Cotterell, F.C.P., B.Sc. (Econ.), "*Bandora,*" *Granville Road, North Finchley, N.*
1880	*d*	Wallis, E. White, "*Rozel,*" *Ruislip-road, Northwood.*
1908	*d*	Wallis, Percy, *Westacre, Kettering.*
1904		*Walsh, Correa M., *Bellport, Long Island, New York, U.S.A.*
1910		Walsh, Robert, F.C.A., 67, *High-street, Belfast.*
1865		Waterhouse, Edwin, A.I.A., F.C.A., 3, *Frederick-place, Old Jewry, E.C.*
1892		Wates, Charles M., 49, *The Pryors, Hampstead, N.W.*
1902	*c d*	WATSON, ALFRED W., F.I.A., *National Health Insurance Joint Committee, Buckingham Gate, S.W.*
1911		Watson, William, *Jesmond, Church-lane, Handsworth, Birmingham.*
1910		*Watt, James, F.F.A., 24, *Rothesay-terrace, Edinburgh.*
1908	*d p*	Webb, Augustus D., B.Sc., 5, *St. George's-avenue, Tufnell Park, N.*
1888		Webb, Henry B., *Holmdale, Dorking.*
1904	*d*	Webb, The Hon. Montagu de Pomeroy, C.I.E., *Karachi, India.*
1893	*d*	Weedon, Thornhill, *Govt. Statistician, Bryn-Mawr, Brisbane.*
1873	*c*	*WELBY, THE RIGHT HON. LORD, G.C.B. (*President*), 11, *Stratton-street, Piccadilly, W.*
1911		*Wellington, His Grace The Duke of, K.G., G.C.V.O., *Apsley House, Piccadilly, W.*
1889		*Wells-Smith, Henry, F.C.A., *Chantrey House, Brookhouse-hill, Fulwood, Sheffield.*
1855	*c d p*	Welton, Thomas A., F.C.A., *Leworth Court, Stanhope-road, Highgate, N.*
1902	*d*	Westall, George, 50, *Bedford Row, W.C.*
1882		*Whadcoat, John H., F.C.A., *Drumstinghall, Dalbeattie.*
1887		Whinney, Frederick, 85, *Avenue-road, Regent's Park, N.W.*
1859		Whitbread, Samuel, *Southill-park, Biggleswade, Beds.*
1887		*White, The Rev. George C., M.A., *Nursling Rectory, Southampton.*
1905		White, Richard, F.C.I.S., 14, *Beachborough Villas, Shorncliffe Road, Folkestone.*

Year of Election.		
1910		Whitehead, Alfred North, F.R.S., 17, *Carlyle-square, S.W.*
1888	*d*	Whitehead, Sir James, Bart., J.P., D.L., *Wilmington Manor, near Dartford.*
1895	*d*	Whitehead, The Hon. Thomas Henderson, M.L.C., *Broadfield, Buntingford, Herts.*
1892	*c d*	Whitelegge, Sir B. Arthur, K.C.B., M.D., 12, *St. Mary Abbott's-terrace, Kensington, W.*
1895		Whittuck, Edward A., M.A., B.C.L., *Claverton Manor, Bath.*
1899		Wiener, Isidore, *Colecroft, Kenley, Surrey.*
1898		Wigham, Matthew T., A.S.A.A., F.C.I.S., 826, *Salisbury House, London Wall, E.C.*
1913		Wigram, Ralph F., *Mount Sandford, Barnstaple, N. Devon.*
1909		Wilbur, Dr. Cressy L., *Chief Statistician, Bureau of the Census, Washington, D.C., U.S.A.*
1913		Wilkinson, Rev. J. Frome, M.A., F.S.A., *Barley Rectory, Royston, Herts.*
1914		Wilkinson, W. F. S., F.R.M.S., *The Northern Banking Co., Ltd., Irvinestown, Ireland.*
1901	*d*	Willcox, Walter F., Ph.D., *Cornell University, Ithaca, N.Y., U.S.A.*
1896		*Williams, Major C. Woolmer, 28, *Prebend-mansions, High-road, Chiswick, W.*
1897	*d*	*Williams, Ernest E., *Ecclefechan, Lake-road, Wimbledon, S.W.*
1901	*d*	Williams, Frederick A., A.I.A., F.A.S., *Apartado* 1420, *Mexico City, Mexico D.F.*
1864		Williams, F. Bessant, F.S.A. (Scot.), 3, *Essex-grove, Central Hill, Upper Norwood, S.E.*
1888		*Williams, Robert, M.P., 20, *Birchin-lane, E.C.*
1909		Williams, Sydney Fairs, 4, *South-street, Finsbury, E.C.*
1911	*p*	Williams, T. Taliesin, B.A., *Dacca College, Dacca, Eastern Bengal and Assam.*
1895		*Willis, J. G., B.A., C.B., *Board of Trade, Whitehall-gardens, S.W.*
1898		Wilson, Herbert W., 203, *Elgin-avenue, W.*
1884	*c p*	WILSON, SIR JAMES, K.C.S.I., 59, *Cadogan-square, S.W.*
1909		Wolfe, Lee J., 161, *Broadway, New York, U.S.A.*
1900	*d*	Wolfe, S. Herbert, 165, *Broadway, New York City, U.S.A.*
1897	*d p*	Wood, George H., *Gwyndy, Netherton, Nr. Huddersfield.*

Year of Election.		
1913	d p	Wood, Mrs., 53, *Overstrand Mansions, Prince of Wales Road, S.W.*
1897		Woodd, Basil A. H., *Abbotsfield, Wiveliscombe, Somerset.*
1890		*Woollcombe, Robert L., LL.D., &c., 14, *Waterloo-road, Dublin.*
1903		Woolley, Ernest, 7, *Finch-lane, Cornhill, E.C.*
1895		Worsfold, Edward M., F.C.A., *Market Square, Dover.*
1912		Wotzel, A. A., "*Bohemia,*" *Belmont, Surrey.*
1906		Wyldbore-Smith, Edmund C., *The Foreign Office, S.W.*
1868	c d p	Yerburgh, Robert A., M.P., 25, *Kensington Gore, S.W.*
1900	d	Yerbury, John E., 3, *Queen-street, Cheapside, E.C.*
1877		*Youll, John G., *Jesmond-road, Newcastle-on-Tyne.*
1911		Young, Professor Allyn A., *Cornell University, Ithaca, New York, U.S.A.*
1913		Young Edward Hilton, 35, *Kensington Square, W.*
1898		Young, Sydney, *The Corn Exchange, Mark-lane, E.C.*
1895	c d p	YULE, G. UDNY, M.A. (*Hon. Secretary*), *St. John's College, Cambridge.*

Year of Election.	
1901	Zimmerman, Lawrence W., 104, *Buckingham-rd., Heaton Moor, Manchester.*
1913	Zimmern, Miss Dorothy Margaret, M.A., 14, *Great Russell Mansions, Great Russell Street, W.C.*

⁂ *The Honorary Secretaries request that any inaccuracy in the foregoing list, and all changes of address, may be notified to the* ASSISTANT SECRETARY.

HONORARY FELLOWS.

HIS MOST GRACIOUS MAJESTY THE KING.
Patron.

Argentine Republic.

Year of Election.

1890 *d* FRANCISCO LATZINA, **Calle Maipu, 982, Buenos Ayres.**
Director General of Statistics; Doctor *honoris causâ* of the Faculty of Physical and Mathematical Sciences of the University of Cordoba; Knight of the Austrian Order of the Iron Crown; Knight of the Italian Order of S.S. Maurice and Lazare; Officer of the Academy of France; Member of the National Academy of Sciences, of the International Statistical Institute, of the Geographical and Statistical Societies of Paris, of the Society of Commercial Geography of Paris, and Corresponding Member of the National Historical Academy of Venezuela.

Belgium.

1904 *d* EMILE WAXWEILER, **Parc Leopold, Brussels.**
Director of the Solvay Sociological Institute, Brussels; Professor of Statistics, Economics and Sociology at the University of Brussels; Member of the International Statistical Institute; Member of the Royal Academy of Belgium.

Denmark.

1878 *d* VIGAND ANDREAS FALBE-HANSEN, **Copenhagen.**
Late Director of the Statistical Bureau of the State; late Professor of Political Economy at the University of Copenhagen; Director of the Life and Fire Office "Danmark"; *Doctor Juris*; Life Member of the Upper House of Legislation (Landsthing); Knight Commander of the Order of the "Danebrog."

1900 *d p* MARCUS RUBIN, **Vendersgade 25a, Copenhagen.**
Knight of the Order of the "Danebrog"; Director-General of Customs and Taxation; late Director of the Statistical Bureau of the State; President of the Danish Society of Political Economy and of the Board of the Danish Society of History; Member of the International Statistical Institute.

Year of Election

Denmark—*Contd.*

1907 *d p* HARALD LUDVIG WESTERGAARD, **Scherfigsvej, Copenhagen.**
Professor of Political Economy and Statistics at the University of Copenhagen.

France.

1889 *d p* JACQUES BERTILLON, M.D., **1, Avenue Victoria, Paris.**
Late Chief of the Statistical Department of the City of Paris; Member of the Superior Council of Statistics; of the Consultative Committee of Public Hygiene of France; Past President of the Statistical Society of Paris; and Member of the International Statistical Institute, &c.

1879 *d* ARTHUR CHERVIN, M.D., **82, Avenue Victor Hugo, Paris, XVIe.**
Doctor of Medicine and Surgery; Director of the Paris Institute for Stammerers; Past President of the Statistical Society of Paris; Member of the Superior Council of Statistics, &c.

1908 *d p* YVES GUYOT, **95, Rue de Seine, Paris.**
Member of the Superior Council of Statistics; ex-President of the Statistical Society of Paris; ex-Minister of Public Works; Guy Medallist; Hon. Member of the Cobden Club; Vice-President of the Society of Political Economy; Editor of the "Journal des Economistes," &c.

1911 *d p* LUCIEN MARCH, **97, Quai D'Orsay, Paris, France.**
Statistique Générale de la France.

1910 *d* M. EUGÈNE TISSERAND, **17, Rue de Cirque, Paris.**
Corresponding Member of the Academy of Sciences (Institute of France); ex-Councillor of State; Honorary Director of Agriculture; ex-Member of the Superior Council of Statistics; ex-President of the Statistical Society of Paris.

1887 DANIEL WILSON, **2, Avenue d'Jéna, Paris.**
Ex-Under-Secretary of State; Past President of the Statistical Society of Paris.

1876 *d* THE PRESIDENT (for the time being) OF THE STATISTICAL SOCIETY OF PARIS, **28, Rue Serpente Danton, Paris.**

Year of Election

Germany.

1896 *d* CARL VICTOR BÖHMERT, **Hospitalstrasse, 4, Dresden.**
Geheimer Regierungsrath; Doctor Juris; Late Director of the Statistical Bureau of Saxony; Professor of Political Economy and Statistics in the Polytechnical High School of Dresden; Member of the International Statistical Institute.

1908 *d* RICHARD VAN DER BORGHT, **Kaiserallee, 26, Wilmersdorf-Berlin.**
Dr. *phil.*; Late President of the Imperial Statistical Office; President of the Council for Labour Statistics; Member of the Prussian Central Statistical Commission; Corresponding Member of the Belgian Central Statistical Commission; Member of the International Statistical Institute; formerly Professor of Political Economy at the Technical High School of Aachen.

1904 *d* DR. WILHELM LEXIS, **Göttingen.**
Professor of Economics and Statistics at the University of Göttingen; Vice-President of the International Statistical Institute.

1877 *d* GEORG VON MAYR, **Georgenstrasse, 38, Munich.**
Ex-Under Secretary of State in the Imperial Ministry for Alsace-Lorraine; formerly Director of the Royal Statistical Bureau of Bavaria; Honorary Member of the International Statistical Institute; Ordinary Professor of Statistics, Finances, and Political Economy at the University of Munich; Associate of the Statistical Society of Paris.

1897 *d* ADOLPH WAGNER, Ph.D., **51, Lessingstrasse, Berlin, N.W.**
Professor of Political Economy at the University of Berlin; Member of the Statistical Bureau of Prussia, and of the International Statistical Institute.

1876 *d* THE PRESIDENT (for the time being) OF THE GEOGRAPHICAL AND STATISTICAL SOCIETY OF FRANKFORT, **Stadtbibliothek, Frankfort.**

Hungary.

1904 *d* JULIUS DE VARGHA, DR. *JURIS*. **Budapest.**
Director of the Central Statistical Office of Hungary; Member of the Hungarian Academy of Sciences and of the "Society Kisfaludy"; President of the Commission for the preparation of the annual administration report on Hungary; Member of the International Statistical Institute, &c.

Year of Election.

Italy.

1874 *d* LUIGI BODIO, **153, Via Torino, Rome.**
Senator; Doctor of Laws; Councillor of State; President of the Council of Statistics of the Kingdom; President of the Council of Emigration; President of the International Statistical Institute; Member of the Royal Academy "dei Lincei"; Correspondent of the Institute of France (Academy of Moral and Political Sciences).

1899 *d* CARLO FRANCESCO FERRARIS, **Via 20 settembre, 7, Padua.**
Professor of Administrative Science and Law at the Royal University of Padua; Member of the Superior Council of Statistics of Italy; Member of the Royal Academy "dei Lincei," of the Royal Institute of Science at Venice, of the International Statistical Institute, and Honorary Member of the Swiss Statistical Society; Member *associé* of the Statistical Society of Paris; ex-Minister of Public Works; Senator of the Italian Kingdom.

Japan.

1910 *d* COUNT Y. YANAGISAWA, **1, Shiba Tamachi, 8 chome, Tokio.**
Member of the House of Peers; Honorary Member of the Bureau of General Statistics, Imperial Cabinet; Honorary Counsellor of Statistical Department of City of Tokio; Member of National Census Committee; late Professor of Statistics at Waseda University; Member of International Statistical Institute; Honorary Member of Statistical Society of Formosa, &c., &c.

Netherlands.

1904 *d* C. A. VERRIJN STUART, **Professor at the University, Groningen, Holland.**
Professor of Political Economy and Statistics at the University, Groningen; President of the Central Statistical Commission of the Netherlands; Secretary-General of International Statistical Institute; late Director of the Central Statistical Bureau of the Netherlands; Corresponding Member of Statistical Society of Paris; Honorary Member of the Cobden Club.

Norway.

1874 *d* ANDERS NICOLAI KIÆR, **Christiania.**
Director of the Central Statistical Bureau of Norway; Associate of the Statistical Society of Paris; Member of the International Statistical Institute.

Year of Election

Russia.

1914 M. P. GEORGIEVSKY, **Comité Central de Statistique, St. Petersburg.**

Sweden.

1909 *d* DR. GUSTAV SUNDBÄRG, **Sibyllagat 72, Stockholm.**
Professor of Statistics; Compiler of the series "Aperçus statistiques internationaux."

Switzerland.

1890 LOUIS GUILLAUME, **Bern.**
Doctor of Medicine; Director of the Federal Statistical Bureau; Member of the International Statistical Institute.

Turkey.

1911 HIS EXCELLENCY DJAVID BEY, **Minister of Public Works, Constantinople.**

United States.

1873 *d* THE HON. WILLIAM BARNES, **The O'Conor-Barnes Homestead, On the Cliff, Nantucket Island, Mass., U.S.A.**
Lawyer; ex-Superintendent of the Insurance Department, State of New York.

1896 *d* WORTHINGTON CHAUNCEY FORD, c/o **Massachusetts Historical Society, Boston, Mass., U.S.A.**
Late Chief of the Bureau of Statistics, Treasury Department; late Chief of the Bureau of Statistics, Department of State; Member of the International Statistical Institute.

1911 *d* THE PRESIDENT (for the time being) OF THE AMERICAN STATISTICAL ASSOCIATION, **Boston.**

Tasmania.

1894 *d* ROBERT MACKENZIE JOHNSTON, I.S.O., **Hobart.**
Registrar-General and Government Statistician; Fellow and Member of Council of the Royal Society of Tasmania; Member of Council and of Senate of the University of Tasmania; Fellow and Past President of Section F (*Economics* and *Statistics*) of the Australasian Association for the Advancement of Science; Fellow of the Royal Geographical Society of Australia; Honorary Foreign Corresponding Member of the Geological Society of Edinburgh; Fellow of the Linnean Society of London.

Great Britain and Ireland.

Year of Election		
1876	*d*	THE PRESIDENT (for the time being) OF THE MANCHESTER STATISTICAL SOCIETY, **3, York Street, Manchester.**
1876	*d*	THE PRESIDENT (for the time being) OF THE STATISTICAL AND SOCIAL INQUIRY SOCIETY OF IRELAND, **93, Stephen's Green, Dublin.**

⁂ The Honorary Secretaries request that any inaccuracies in the List of HONORARY FELLOWS, and all changes of address, may be notified to the Assistant Secretary.

ROYAL STATISTICAL SOCIETY.

Copy of Charter.

Victoria, by the Grace of God of the United Kingdom of Great Britain and Ireland Queen, Defender of the Faith.

To all to whom these Presents shall come, Greeting:—

Whereas Our Right trusty and entirely beloved cousin, Henry, Third Marquess of Lansdowne, Knight of the Most Noble Order of the Garter, Charles Babbage, Fellow of the Royal Society, John Elliott Drinkwater, Master of Arts, Henry Hallam, Fellow of the Royal Society, the Reverend Richard Jones, Master of Arts, and others of Our loving subjects, did, in the year One thousand eight hundred and thirty-four, establish a Society to collect, arrange, digest and publish facts, illustrating the condition and prospects of society in its material, social, and moral relations; these facts being for the most part arranged in tabular forms and in accordance with the principles of the numerical method, and the same Society is now called or known by the name of "The "Statistical Society."

And Whereas it has been represented to Us that the same Society has, since its establishment, sedulously pursued such its proposed objects, and by its publications (including those of its transactions), and by promoting the discussion of legislative and other public measures from the statistical point of view, has greatly contributed to the progress of statistical and economical science.

And Whereas distinguished individuals in foreign countries, as well as many eminent British subjects, have availed themselves of the facilities offered by the same Society for communicating important information largely extending statistical knowledge; and the general interest now felt in Statistics has been greatly promoted and fostered by this Society.

And Whereas the same Society has, in aid of its objects, collected a large and valuable library of scientific works and charts, to which fresh accessions are constantly made; and the said Society has hitherto been supported by annual and other subscriptions and contributions to its funds, and has lately acquired leasehold premises in which the business of the said Society is carried on.

And Whereas in order to secure the property of the said Society, to extend its operations, and to give it its due position among the Scientific Institutions of Our kingdom, We have been besought to grant to Sir Rawson William Rawson, Knight Commander of the Most Distinguished Order of St. Michael and St. George, and Companion of the Most Honourable Order of the Bath, and to those who now are Members of the said Society, or who shall from time to time be elected Fellows of the Royal Statistical Society hereby incorporated, Our Royal Charter of Incorporation for the purposes aforesaid.

1. **Now Know Ye** that We, being desirous of encouraging a design so laudable and salutary, of Our especial grace, certain knowledge and mere motion, have willed, granted, and declared and Do by these Presents, for Us, Our heirs and successors, will, grant, and declare that the said Sir Rawson William Rawson, Knight Commander of the Most Distinguished Order of St. Michael and St. George, and Companion of the Most Honourable Order of the Bath, and such other of Our loving subjects as now are Members of the said Society, or shall from time to time be elected Fellows of "The Royal Statistical Society" hereby incorporated according to such regulations or bye laws as shall be hereafter framed or enacted, and their successors, shall for ever hereafter be by virtue of these presents one body politic and corporate, by the name of "**The Royal Statistical Society,**" and for the purposes aforesaid, and by the name aforesaid, shall have perpetual succession and a common seal, with full power and authority to alter, vary, break, and renew the same at their discretion, and by the same name to sue and be sued, implead and be impleaded, answer and be answered, unto and in every Court of Us, Our heirs and successors.

2. **The** Royal Statistical Society, in this Charter hereinafter called "The Society," may, notwithstanding the statutes of mortmain, take, purchase, hold and enjoy to them and their successors a hall, or house, and any such messuages or hereditaments of any tenure as may be necessary, for carrying out the purposes of the Society, but so that the yearly value thereof to be computed at the rack rent which might be gotten for the same at the time of the purchase or other acquisition, and including the site of the said hall, or house, do not exceed in the whole the sum of Two thousand pounds.

3. **There** shall be a Council of the Society, and the said Council and General Meetings of the Fellows to be held in accordance with this Our Charter shall, subject to the provisions of this Our Charter, have entire the management and direction of the concerns of the Society.

4. **There** shall be a President, Vice-Presidents, a Treasurer or Treasurers, and a Secretary or Secretaries of the Society. The Council shall consist of the President, Vice-Presidents, and not

less than twenty Councillors; and the Treasurer or Treasurers and the Secretary or Secretaries if honorary.

5. **The** several persons who were elected to be the President, Vice-Presidents, and Members of the Council of the Statistical Society at the Annual Meeting held in the month of June, One thousand eight hundred and eighty-six, shall form the first Council of the Society, and shall continue in office until the first Election of officers is made under these presents as hereinafter provided.

6. **General** Meetings of the Fellows of the Society may be held from time to time, and at least one General Meeting shall be held in each year. Every General Meeting may be adjourned, subject to the provisions of the Bye Laws. The following business may be transacted by a General Meeting, viz.:—

(*a.*) The Election of the President, Vice-Presidents, Treasurer or Treasurers, Secretary or Secretaries, and other Members of the Council of the Society.
(*b.*) The making, repeal, or amendment of Bye Laws.
(*c.*) The passing of any proper resolution respecting the affairs of the Society.

7. **Bye Laws** of the Society may be made for the following purposes, and subject to the following conditions, viz.:—

(*a.*) For prescribing the qualification and condition of tenure of office of the President; the number, qualifications, functions, and conditions of tenure of office of the Vice-Presidents, Treasurers, Secretaries, and Members of Council, and Officers of the Society; for making regulations with respect to General Meetings and Meetings of the Council and proceedings thereat, and for the election of any persons to be Honorary Fellows or Associates of the Society, and defining their privileges (but such persons, if elected, shall not be Members of the Corporation), and for making regulations respecting the making, repeal and amendment of Bye Laws, and generally for the government of the Society and the management of its property and affairs.
(*b.*) The first Bye Laws shall be made at the first General Meeting to be held under these presents, and shall (amongst other things) prescribe the time for holding the first election of officers under these presents.

8. **The** General Meetings and adjourned General Meetings of the Society shall take place (subject to the rules or bye laws of the Society, and to any power of convening or demanding a

Special General Meeting thereby given) at such times and places as may be fixed by the Council.

9. **The** existing rules of the Statistical Society, so far as not inconsistent with these presents, shall be in force as the Bye Laws of the Society until the first Bye Laws to be made under these presents shall come into operation.

10. **Subject** to these presents and the Bye Laws of the Society for the time being, the Council shall have the sole management of the income, funds, and property of the Society, and may manage and superintend all other affairs of the Society, and appoint and dismiss at their pleasure all salaried and other officers, attendants, and servants as they may think fit, and may do all such things as shall appear to them necessary or expedient for giving effect to the objects of the Society.

11. **The** Council shall once in every year present to a General Meeting a report of the proceedings of the Society, together with a statement of the receipts and expenditure, and of the financial position of the Society, and every Fellow of the Society may, at reasonable times to be fixed by the Council, examine the accounts of the Society.

12. **The** Council may, with the approval of a General Meeting, from time to time appoint fit persons to be Trustees of any part of the real or personal property of the Society, and may make or direct any transfer of such property so placed in trust necessary for the purposes of the trust, or may, at their discretion, take in the corporate name of the Society conveyances or transfers of any property capable of being held in that name. Provided that no sale, mortgage, incumbrance, or other disposition of any hereditaments belonging to the Society shall be made unless with the approval of a General Meeting.

13. **No** Rule, Bye Law, Resolution, or other proceeding shall be made or had by the Society, or any meeting thereof, or by the Council, contrary to the general scope or true intent and meaning of this Our Charter, or the laws or statutes of Our Realm, and anything done contrary to this present clause shall be void.

In Witness whereof We have caused these Our Letters to be made Patent.

Witness Ourself, at Westminster, the thirty-first day of January, in the fiftieth year of Our Reign.

By Warrant under the Queen's Sign Manual,

(L. S.)

MUIR MACKENZIE.

ROYAL STATISTICAL SOCIETY.

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BYE-LAWS OF THE ROYAL STATISTICAL SOCIETY.

Objects of the Society.

1. The objects of the Royal Statistical Society are to collect, arrange, digest and publish facts, illustrating the condition and prospects of society in its material, social and moral relations; these facts being for the most part arranged in tabular forms and in accordance with the principles of the numerical method.

The Society collects new materials, condenses, arranges, and publishes those already existing, whether unpublished or published in diffuse and expensive forms in the English or in any foreign language, and promotes the discussion of legislative and other public measures from the statistical point of view. These discussions form portions of the published Transactions of the Society.

Constitution of the Society.

2. The Society consists of Fellows and Honorary Fellows, elected in the manner hereinafter described.

Number of Fellows and Honorary Fellows.

3. The number of Fellows is unlimited. Foreigners or British subjects of distinction residing out of the United Kingdom may be admitted as Honorary Fellows, of whom the number shall not be more than seventy at any one time.

Proposal of Fellows.

4. Every Candidate for admission as a Fellow of the Society shall be proposed by two or more Fellows, who shall certify from their personal knowledge of him or of his works, that he is a fit person to be admitted a Fellow of the Society. Every such certificate having been read and approved of at a Meeting of the Council, shall be suspended in the office of the Society until the following Ordinary Meeting, at which the vote shall be taken.

Election of Fellows.

5. In the election of Fellows, the votes shall be taken by ballot. No person shall be admitted unless at least sixteen Fellows vote, and unless he have in his favour three-fourths of the Fellows voting.

Admission of Fellows.

6. Every Fellow elect is required to take the earliest opportunity of presenting himself for admission at an Ordinary Meeting of the Society.

The manner of admission shall be thus:—

Immediately after the reading of the minutes, the Fellow elect, having first paid his subscription for the current year or his composition, shall sign the obligation contained in the Fellowship-book, to the effect following:—

"We, who have underwritten our "names, do hereby undertake, each for "himself, that we will endeavour to "further the good of the Royal Statis- "tical Society for improving Statistical "Knowledge, and the ends for which "the same has been founded; that we "will be present at the Meetings of the "Society as often as conveniently we "can, and that we will keep and fulfil "the Bye-laws and Orders of this "Society: provided that whensoever "any one of us shall make known, by "writing under his hand, to the Secre- "taries for the time being, that he "desires to withdraw from the Society, "he shall be free thenceforward from "this obligation."

Whereon the President, taking him by the hand, shall say,—"By the "authority, and in the name of the "Royal Statistical Society, I do admit "you a Fellow thereof."

Upon their admission Fellows shall have the right of attaching to their names the letters F.S.S., but not in connection with any trading or business advertisement other than the publication of any book or literary notice.

Admission of Honorary Fellows.

7. There shall be Two Meetings of the Society in the year, on such days as shall be hereafter fixed by the Council, at which Honorary Fellows may be elected.

No Honorary Fellow can be recommended for election but by the Council. At any Meeting of the Council any Member thereof may propose a Foreigner or British subject of distinction residing out of the United Kingdom, delivering at the same time a written statement of the qualifications of, offices held by, and published works of, the person proposed; and ten days' notice at least shall be given to every Member of the Council, of the day on which the Council will vote by ballot on the question whether they will recommend to the Society the election of the person proposed. No such recommendation to the Society shall be adopted unless at least three-fourths of the votes are in favour thereof.

Notice of the recommendation shall be given from the chair at the Meeting of the Society next preceding that at which the vote shall be taken thereon. No person shall be elected an Honorary Fellow unless sixteen Fellows vote and three-fourths of the Fellows voting be in his favour.

The Council shall have power to elect as Honorary Fellows, the Presidents for the time being of the Statistical Societies of Dublin, Manchester, and Paris, and the President of any other Statistical Society at home or abroad.

Payments by Fellows.

8. Every Fellow of the Society shall pay a yearly subscription of Two Guineas, or may at any time compound for his future yearly payments by paying at once the sum of Twenty Guineas,* or after the payment of twenty-five annual subscriptions the sum of Ten Guineas, unless the Annual Subscription or Composition Fee shall be remitted by the Council; provided that the number of Fellows whose Annual Subscription or Composition Fee shall have been thus remitted, do not exceed five at any one time.

Every person elected to the Society shall pay his first subscription (or if he desire to become a Life Fellow, his composition) within three months, at the latest, of the date of his election, if he be resident in the United Kingdom. If he be resident abroad, this period shall be six months. If payment be not made within the time specified above, the election shall be void.

Defaulters.—Withdrawal of Fellows.

9. All yearly payments are due in advance on the 1st of January, and if any Fellow of the Society have not paid his subscription before the 1st of July, he shall be applied to in writing by the Secretaries, and if the same be not paid before the 1st of January ot the second year, a written application shall again be made by the Secretaries, and the Fellow in arrear shall cease to receive the Society's publications, and shall not be entitled to any of the privileges of the Society until such arrears are paid; and if the subscription be not discharged before the 1st of February of the second year, the name of the Fellow thus in arrear shall be exhibited on a card suspended in the office of the Society; and if, at the next Annual General Meeting, the amount still remain unpaid, the defaulter shall, unless otherwise authorised by the Council, be announced to be no longer a Fellow of the Society, the reason for the same being at the same time assigned. No Fellow of the Society can withdraw his name from the Society's books, unless all arrears be paid; and no resignation will be deemed valid unless a written notice thereof be communicated to the Secretaries. No Fellow shall be entitled to vote at any Meeting of the Society until he shall have paid his subscription for the current year.

Expulsion of Fellows.

10. If any Fellow of the Society, or any Honorary Fellow, shall so demean himself that it would be for the dishonour of the Society that he longer continue to be a Fellow or Honorary Fellow thereof, the Council shall take the matter into consideration; and if the majority of the Members of the Council present at some Meeting (of which and of the matter in hand such Fellow or Honorary Fellow, and every Member of the Council, shall have due notice) shall decide by ballot to recommend that such Fellow or Honorary Fellow be expelled from the Society, the President shall at its next Ordinary Meeting announce to the Society the recommendation of the Council, and at the following Meeting the question shall be decided by ballot, and if at least three-fourths of the

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* Cheques should be made payable to "The Royal Statistical Society," and crossed "Messrs. Drummond and Co."

number voting are in favour of the expulsion, the President shall forthwith cancel the name in the Fellowship-book, and shall say,—

"By the authority and in the name "of the Royal Statistical Society, I do "declare that A. B. (naming him) is no "longer a Fellow (or Honorary Fellow) "thereof."

And such Fellow or Honorary Fellow shall thereupon cease to be of the Society.

Trustees.

11. The property of the Society may be vested in three Trustees, chosen by the Fellows. The Trustees are eligible to any other offices in the Society.

President, Council, and Officers.

12. The Council shall consist of a President and thirty Members, together with the Honorary Vice-Presidents.

From the Council shall be chosen four Vice-Presidents, a Treasurer, the Honorary Secretaries, and a Foreign Secretary, who may be one of the Honorary Secretaries. The former Presidents who are continuing Fellows of the Society shall be Honorary Vice-Presidents. Any five of the Council shall be a quorum.

Election of President and Officers.

13. The President, Members of Council, Treasurer, and Honorary and Foreign Secretaries shall be chosen annually by the Fellows at the Annual General Meeting.

The Vice-Presidents shall be chosen annually from the Council by the President.

The President shall not be eligible for the office more than two years in succession.

Six Fellows, at least, who were not of the Council of the previous year, shall be annually elected; and of the Members retiring three at least shall be those who have served longest continuously on the Council, unless they hold office as Treasurer or Honorary or Foreign Secretary.

Nomination of President, Council, and Officers.

14. The Council shall, previously to the Annual General Meeting, nominate, by ballot, the Fellows whom they recommend to be the next President and Council of the Society. They shall also recommend for election a Treasurer and the Secretaries (in accordance with Rule 12). Notice shall be sent to every Fellow whose residence is known to be within the limits of the metropolitan post, at least a fortnight before the Annual General Meeting, of the names of Fellows recommended by the Council.

Extraordinary Vacancies.

15. On any extraordinary vacancy occurring of the Office of President, or other Officer of the Society, the Honorary Secretaries shall summon the Council with as little delay as possible, and a majority of the Council, thereupon meeting in their usual place, shall, by ballot, and by a majority of those present, choose a new President, or other Officer of the Society, to be so until the next Annual General Meeting.

Committees.

16. The Council shall have power to appoint Committees of Fellows and also an Executive Committee of their own body. The Committees shall report their proceedings to the Council. No report shall be communicated to the Society except by the Council.

Auditors.

17. At the first Ordinary Meeting of each year, the Fellows shall choose two Fellows, not being Members of the Council, as Auditors, who, with one of the Council, chosen by the Council, shall audit the Treasurer's accounts for the past year, and report thereon to the Society, which report shall be presented at the Ordinary Meeting in February. The Auditors shall be empowered to examine into the particulars of all expenditure of the funds of the Society, and may report their opinion upon any part of it.

Meetings Ordinary and General.

18. The Ordinary Meetings of the Society shall be held monthly, or oftener, during the Session, which shall be from the 1st of November to the 1st of July in each year, both inclusive, on such days and at such hours as the Council shall declare. The Annual General Meeting shall be held on such day in the month of June of each year as shall be appointed by the Council for the time being.

Business of Ordinary Meetings.

19. The business of the Ordinary Meetings shall be to elect and admit Fellows, to read and hear reports, letters, and papers on subjects interesting to the Society. Nothing relating to the bye-laws or management of the Society shall be discussed at the Ordinary Meetings, except that the Auditors' Report shall be presented at the Ordinary Meeting in February, and that the Minutes of the Annual General Meeting, and of every Special General Meeting, shall be submitted for confirmation at the next Ordinary Meeting after the day of such Annual or Special General Meeting. Strangers may be introduced to the Ordinary Meetings, by any Fellow, with the leave of the President, Vice-President, or other Fellow presiding at the Meeting.

Business of Annual General Meeting.

20. The business of the Annual General Meeting shall be to elect the Officers of the Society, and to discuss questions on its bye-laws and management. No Fellow or Honorary Fellow shall be proposed at the Annual General Meeting. No Fellow shall propose any alteration of the rules or bye-laws of the Society at the Annual General Meeting, unless after three weeks' notice thereof given in writing to the Council, but amendments to any motion may be brought forward without notice, so that they relate to the same subject as the motion. The Council shall give fourteen days' notice to every Fellow of all questions of which such notice shall have been given to them.

Special General Meetings.

21. The Council may, at any time, call a Special General Meeting of the Society when it appears to them necessary. Any twenty Fellows may require a Special General Meeting to be called, by notice in writing signed by them, delivered to one of the Secretaries, specifying the questions to be moved. The Council shall, within one week of such notice, appoint a day for such Special General Meeting, and shall give at least one week's notice of every Special General Meeting, and of the questions to be moved, to every Fellow within the limits of the metropolitan post, whose residence is known. No business shall be brought forward at any Special General Meeting other than that specified in the notice convening the same.

Duties of the President.

22. The President shall preside at all Meetings of the Society, Council, and Committees which he shall attend, and in case of an equality of votes, shall have a second or casting vote. He shall sign all diplomas of admission of Honorary Fellows. He shall admit and expel Fellows and Honorary Fellows, according to the bye-laws of the Society.

Duties of the Treasurer.

23. The Treasurer shall receive all moneys due to, and pay all moneys owing by, the Society, and shall keep an account of his receipts and payments. No sum exceeding Ten Pounds shall be paid but by order of the Council, excepting always any lawful demand for rates or taxes. The Treasurer shall invest the moneys of the Society in such manner as the Council shall from time to time direct.

Duties of the Honorary Secretaries.

24. The Honorary Secretaries shall, under the control of the Council, conduct the correspondence of the Society; they or one of them shall attend all Meetings of the Society and Council, and shall duly record the Minutes of the Proceedings. They shall issue the requisite notices, and read such papers to the Society as the Council may direct.

Powers of the Vice-Presidents.

25. A Vice-President, whether Honorary or nominated, in the chair, shall act with the power of the President in presiding and voting at any Meeting of the Society or Council, and in admitting Fellows; but no Vice-President shall be empowered to sign diplomas of admission of Honorary Fellows, or to expel Fellows or Honorary Fellows. In the absence of the President and Vice-Presidents, any Member of Council may be called upon by the Fellows then present, to preside at an Ordinary or Council Meeting, with the same power as a Vice-President.

Powers of the Council.

26. The Council shall have control over the papers and funds of the Society, and may, as they shall see fit, direct the publication of papers and the expenditure of the funds, in accordance with the provisions of the Charter.

27. The Council shall be empowered at any time to frame Regulations not inconsistent with these bye-laws, which shall be and remain in force until the next Annual General Meeting, at which they shall be either affirmed or annulled; but no Council shall have power to renew Regulations which have once been disapproved at an Annual General Meeting.

28. The Council shall have the custody of the Common Seal. The Common Seal shall not be affixed to any instrument, deed, or other document, except by order of the Council and in the presence of at least two Members of the Council and in accordance with such other regulations as the Council shall from time to time prescribe. The fact of the seal having been so affixed shall be entered on the minutes of the Council.

29. No Dividend, Gift, Division, of Bonus in money shall be made by the Society, unto or between any of the Fellows or Members, except as hereinafter provided.

30. The Council shall publish a Journal of the Transactions of the Society, and such other Statistical Publications as they may determine upon, and may from time to time pay such sums to Editors and their assistants, whether Fellows of the Society or not, as may be deemed advisable.

31. All communications to the Society are the property of the Society, unless the Council allow the right of property to be specially reserved by the Contributors.

REGULATIONS OF THE LIBRARY.

1. The Library and the Reading Room are open daily from 10 a.m. to 7 p.m. during the Session, and in other months from 10 a.m. to 5 p.m., except on Saturdays, when they are closed at 2 p.m.

2. Every Fellow, whose subscription is not in arrear, is entitled to consult books and to use the Reading Room. Persons who are non-Fellows may be allowed to use the Library and Reading Room for a definite period on presentation to the Librarian of an introduction by a Member of Council. All cases in which temporary permission has been granted to non-Fellows shall be reported to the Library Committee at its next meeting. No books may be borrowed except by Fellows.

3. Fellows resident in the United Kingdom may borrow books from the Library on personal application, or by letter addressed to the Assistant Secretary or Librarian, all expenses for carriage being paid by them.

4. No Fellow may have more than ten volumes out at any one time or keep any book longer than one month, except by special authority from the Chairman of the Library Committee or an Honorary Secretary.

5. Cyclopædias, books of reference, and unbound scientific journals and periodicals may be borrowed only on the written order of an Honorary Secretary for a period not exceeding *four days*. If books so lent be not returned within the specified time, the borrower shall incur a fine of one shilling per day per volume for each day they are detained beyond the time specified.

6. Any Fellow who damages or loses a book, shall either replace the work or pay a fine equivalent to its value.

7. Readers are not themselves to replace books taken from the shelves, but to lay them on the Library table.

8 Any infringement of these regulations will involve the suspension of the right to the use of the Library, and shall be reported to the Library Committee at its next meeting.

DONORS TO THE LIBRARY.

During the Year 1913-14.

(a) Foreign Countries.

Argentine Republic—
- General Statistical Bureau.
- Ministry of Agriculture.
- *Buenos Ayres.* Provincial and Municipal Statistical Bureaus.
- *Cordoba.* Provincial Statistical Bureau.
- *Tucuman.* Provincial Statistical Bureau.

Austria—
- Central Statistical Commission.
- Health Department.
- Ministry of Agriculture.
- ,, Finance.
- ,, Railways.
- Statistical Department of Ministry of Commerce.
- Austrian Labour Department.
- *Bohemia.* Statistical Bureau.
- *Bosnia and Herzegovina.* Statistical Bureau.
- *Vienna.* Statistical Bureau.
- *Brünn.* Statistical Bureau.
- *Prague.* Statistical Bureau.

Belgium—
- Administration of Mines.
- Army Medical Department.
- Bureau of General Statistics.
- Ministry of Agriculture.
- Ministry of Industry and Labour.
- *Bruges.* The Burgomaster.
- *Brussels.* Bureau of Hygiene.
- *Hasselt.* The Burgomaster.
- Royal Academy of Sciences.
- Institute of Sociology.

Brazil—
- Statistical Bureau.
- "Brazilian Review," The Editor.

Bulgaria. Statistical Bureau.

Chile. Central Statistical Bureau.

China. Inspector-General of Customs.

Colombia. Ministry of Foreign relations.

Cuba—
- National Library of Cuba.
- Secretaria de Hacienda.
- Chamber of Commerce.
- La Reforma Social, The Editor.

Denmark—
- State Statistical Bureau.
- *Copenhagen.* Statistical Bureau.
- Political Economy Society.
- *Iceland.* Statistical Bureau.

Egypt—
- Department of Public Health.
- Director-General of Customs.
- ,, Post Office.
- Statistical Department, Ministry of Finance.
- Comité de Conservation des Monuments de l'Art Arabe.
- Egypte Contemporaine, The Editor.
- Public Debt Office.

France—
- Chief of General Statistics of France.

During the Year 1913–14—*Contd.*

(a) **Foreign Countries**—*Contd.*

France—Contd.

Director-General of Customs.
" Direct Taxation.
Director of the Mint.
Labour Department.
Colonial Office.
Ministry of Agriculture.
" Finance.
" Justice.
" Marine.
" Public Works.

Paris—
British Ch. of Commerce.
Statistical Bureau.

Lyons. Silk Merchants' Union.
Economiste Français, The Editor.
Journal des Economistes, The Editor.
Monde Economique, The Editor.
Polybiblion, Revue Bibliographique Universelle, The Editor.
Réforme Sociale, The Editor.
Rentier, Le, The Editor.
Revue d'Economie Politique, The Editor.
Bank of France.
Statistical Society of Paris.

Germany—
Imperial Health Bureau.
" Insurance Bureau.
" Statistical Bureau.
German Consul-General, London.
German Labour Department.

Prussia—
Royal Statistical Bureau.
Minister of Agriculture.

Saxony. Royal Statistical Bureau.
Alsace-Lorraine. Statistical Bureau.
Baden. Statistical Bureau.
Berlin. Statistical Bureau.
Dresden. Gege-Stiftung.
Dusseldorf. Statistical Bureau.
Frankfurt. Statistical Bureau.

Germany—Contd.

Hamburg. Statistical Bureau.
Mannheim. Statistical Bureau.
Munich. Statistical Bureau.
Oldenburg. Statistical Bureau.
Wiesbaden. Statistical Bureau.
Nürnberg. Statistical Bureau.
Allgemeines Statistisches Archiv, The Editor.
Archiv für Rassen- und Gesellschafts-Biologie, The Editor.
Archiv für Sozialwissenschaft, &c. The Editor.
Jahrbuch für Gesetzgebung, &c., The Editor.
Jahrbücher für Nationalökonomie und Statistik, The Editor.
Zeitschrift für die gesamte Staatswissenschaft, The Editor.
Zeitschrift für Socialwissenschaft, The Editor.
Deutsche Statistische Gesellschaft.
Geographical and Statistical Society of Frankfurt.
Verein für Versicherungs-Wissenschaft.

Greece. Ministry of Finance.

Honduras. Economic Review. The Publisher.

Hungary—
Central Statistical Office.
Ministry of Agriculture.
Royal Hungarian Insurance Office.
Budapest. Statistical Bureau.

Italy—
Director-General of Customs.
" Public Health.
Director-General of Statistics and Labour.
Labour Department.
Ministry of Agriculture.
" Justice.

During the Year 1913–14—*Contd.*

(a) **Foreign Countries**—*Contd.*

Florence—
  Statistical Bureau.
  "Cesare Alfieri" Institute of Social Science.
Milan—
  Banca Commerciale Italiana.
  Institute for Housing of Working Classes.
Palermo. University.
Turin. Statistical Bureau.
Venice. Statistical Bureau.
Unione Statistica delle Città Italiane.
Economista, The Editor.
Giornale degli Economisti, The Editor.
Riforma Sociale, The Editor.
Rivista Critica di Scienze Sociali, The Editor.
Rivista Italiana di Sociologia, The Editor.

Japan—
  Consul-General, London.
  Bureau of General Statistics.
  Department of Finance.
  Chosen (Korea). Government-General.
  Taiwan (Formosa). Civil Governor.
  Tokyo. Statistical Society.
  Liberal News Agency, Tokyo.

Luxemburg. Grand Duchy of.
  Statistical Bureau.

Mexico—
  Department of Labour.
  Statistical Bureau.

Netherlands—
  Central Health Bureau.
  ,, Statistical Bureau.
  Ministry of Agriculture, &c.
  ,, Finance.
  Director-General of Customs.
Amsterdam—
  Statistical Bureau.
  The General Life Assurance Company.

Norway—
  Bureau of State Insurance.
  Central Statistical Bureau.
  Christiania—
    Health Department.
    Statistical Bureau.

Paraguay. Statistical Bureau.

Portugal. General Statistical Bureau.

Roumania—
  Ministry of Agriculture.
  Bucharest. Statistical Bureau.

Russia—
  Central Statistical Commission.
  Customs Statistical Bureau.
  Imperial Russian Financial Agency.
  Ministry of Agriculture.
  ,, Finance.
  State Savings Bank Administration.
  Finland. Statistical Bureau.
  St. Petersburg. Statistical Bureau.
  Moscow. Statistical Bureau.
  Kazan. The University.

Salvador. Statistical Bureau.

Servia. Statistical Bureau.

Spain—
  Director-General of Customs.
  Geographical and Statistical Institute.
  Barcelona. Museu Social.
  Madrid. Statistical Bureau.
  Sociedad Anonima Arnus Gari.

During the Year 1913–14—*Contd.*

(a) Foreign Countries—*Contd.*

Sweden—
Central Statistical Bureau.
Department of Agriculture.
Labour Department.

Stockholm—
Health Department.
Statistical Bureau.
Upsala. Royal University.
Svenska Aktuarieforeningens Tidskrift. The Editor.

Switzerland—
Federal Assurance Bureau.
" Statistical Bureau.
" Department of Customs.
Régie fédérale des Alcools.
Swiss Statistical Society.
Swiss Union of Commerce and Industry.
Zurich—
Municipal Statistical Bureau.
Art. Institut Orell Fussli.

Turkey—
Director-General of Indirect Taxation.
British Chamber of Commerce.

United States—
Bureau of Census.
" Education.
" Immigration.
" the Mint.
" Navigation.
Carnegie Foundation.
Comptroller of the Currency.
Department of Agriculture.
Department of Commerce and Labour.
Director of Geological Survey.
Interstate Commerce Commission.
Librarian of Congress.
Naval Observatory.

United States—*Contd.*
Secretary of the Treasury.
Bank of the Manhattan Company.
California—
Bureau of Labor Statistics.
State Board of Health.
University of California.
Connecticut—
State Board of Health.
Bureau of Labor Statistics.
Illinois
Bureau of Labor Statistics.
The University.
Indiana. Department of Statistics.
Iowa. Bureau of Labor Statistics.
Kansas. Bureau of Labor Statistics.
Maine. Bureau of Labor and Industrial Statistics.
Maryland. Bureau of Statistics and Information.
Massachusetts—
Board of Arbitration.
" Health, Lunacy, &c.
Bureau of Labor Statistics.
Worcester State Hospital.
Michigan—
Bureau of Labor Statistics.
Division of Vital Statistics.
Minnesota. Bureau of Labor Statistics.
Missouri. Bureau of Labor Statistics.
Nebraska. Bureau of Statistics.
New Hampshire. Bureau of Labor Statistics.
New Jersey. Bureau of Labor Statistics.
New York—
State Library.
Department of Labor.
State University.

During the Year 1913-14—*Contd.*

(a) Foreign Countries—*Contd.*

United States—Contd.
[illegible]
[illegible]
Ohio. [illegible]
[illegible]
P[illegible]
[illegible]
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[illegible]
[illegible]
Boston. [illegible]
[illegible]
[illegible]
Statistical [illegible]
[illegible]
Chicago. [illegible]
[illegible]
[illegible]
New York City. [illegible]
Public Library.
[illegible]
[illegible]
Bankers' Magazine [illegible]
Bradstreet's [illegible]
Commercial and Financial Chronicle, The Editor.
Commercial America, The Editor.
Journal of Political Economy. The Editor.
Political Science Quarterly. The Editor.
Quarterly Journal of Economics. The Editor.

United States—Contd.
Yale Review, The Editor.
Actuarial Society of America.
American Academy of Political and Social Science.
American Economic Review.
American Philosophical Society.
American Statistical Association.
Columbia University.
Commercial Museum, Philadelphia.
Harvard University.
Insurance Institute of America.
John Crerar Library, Chicago.
Johns Hopkins University.
Prudential Insurance Company of America.
Russell Sage Foundation.
Smithsonian Institution.

Uruguay—
Statistical Bureau.
Montevideo. Statistical Bureau.

Venezuela. Statistical Bureau.

International—
Agricultural Institute.
Federation of Trades Unions.
Federation of Master Cotton Spinners.
Statistical Institute.
International Review.

(b) India, and Colonial Possessions.

India, British—
Secretary of State for India in Council.
Chief Inspector of Mines.
Director-General of Commercial Intelligence.
Geological Survey.
Library, Government of India.
Bengal. The Collector of Customs.

India, British—Contd.
Punjab. Under Secretary to Government.
Sanitary Commission for Punjab.
Rangoon. The Times Press.
Calcutta. Secretary to Committee on Port of.
Madras. Economic Association.

During the Year 1913-14—*Contd.*

(b) **India, and Colonial Possessions**—*Contd.*

India, British—*Contd.*

East India Railway Co.
Indian Engineering, The Editor.
Indian Journal of Medical Research, The Publishers.

Australia, Commonwealth of

Bureau of Census and Statistics.
The Commonwealth Statistician.
High Commissioner.

Canada—

Auditor-General.
Census and Statistics Office.
Clerk, House of Commons.
Commissioner of Customs.
Department of Agriculture.
Director, Dominion Experimental Farms.
Department of Inland Revenues.
" Interior.
" Labour.
" Marine and Fisheries.
Department of Railways and Canals.
Finance Department.
High Commissioner, London.
Militia Council.
Minister of Public Works.
Secretary of State.
Superintendent of Insurance.
Alberta. Provincial Government.
British Columbia. Department of Mines.
Ontario—
Bureau of Industries.
Department of Agriculture.
Manitoba. King's Printer.
Saskatchewan. Department of Agriculture.
Royal Society of Canada.
Royal Bank of Canada.

Ceylon—

Ceylon Government.
Registrar-General.

Jamaica. Registrar-General.

Mauritius. Colonial Secretary.

New South Wales—

Bureau of Statistics.
Agent-General, London.
Controller-General of Prisons.
Registrar of Friendly Societies.
Railway Commissioners, Sydney

New Zealand—

Registrar-General.
Registrar of Friendly Societies.
High Commissioner.
Insurance Department.
Old Age Pension Department.
Labour Department.
New Zealand Institute.
Wellington. Harbour Board.

Queensland—

Agent-General, London.
Government Statistician.

Rhodesia—

British South Africa Company.
Chamber of Mines.

Union of South Africa—

Provincial Secretary.
Department of Commerce and Industries.

South Australia—

The Chief Secretary.
Government Statist.
Public Actuary.
Public Library.

Straits Settlements. Government Secretary, Perak.

During the Year 1913-14—*Contd.*

(b) India and Colonial Possessions—*Contd.*

Tasmania—

Government Railways Department.

Government Statistician.

Royal Society of Tasmania.

Transvaal—

Agricultural Department.

Department of Mines.

Johannesburg—

Chamber of Mines.

Chamber of Commerce.

Victoria—

Agent-General, London.

Government Statistician.

Mines Department.

Registrar for Friendly Societies.

Public Library, &c., Melbourne.

Western Australia—

Agent-General, London.

Department of Mines.

Registrar of Friendly Societies.

Registrar-General and Government Statistician.

United Kingdom and its several Divisions.

United Kingdom—

Admiralty Medical Department.

Army Medical Department.

Army Veterinary Service.

Board of Agriculture and Fisheries.

Board of Trade.

British Museum.

Census Office.

Census of Production Office.

Colonial Office.

Companies in Liquidation, Inspector-General.

Crown Agents for Colonies.

Customs, Commissioners.

Ecclesiastical Commissioners.

Factories and Workshops, Chief Inspector.

Foreign Office.

Friendly Societies, Chief Registrar.

Home Office.

India Office.

Inland Revenue, The Commissioners.

Inspector-General in Bankruptcy.

Joint Stock Companies, The Registrar.

Land Enquiry Committee.

United Kingdom—Contd.

Local Government Board.

National Health Insurance Commission.

Meteorological Office.

Port of London Authority.

Royal Commission on Mines.

,, ,, Poor Laws.

Royal Mint.

War Office.

Woods, Forests, &c., Commissioners.

England—

Census Office.

Registrar-General of England.

London County Council.

London University.

Metropolitan Asylums Board.

,, Water Board.

Battersea Metropolitan Borough.

Wandsworth Borough Council.

Birmingham City Treasurer.

Liverpool Mersey Docks and Harbour Board.

Manchester, City Treasurer.

Nottingham, City Accountant.

Paddington Medical Officer of Health.

During the Year 1913–14—*Contd.*

(c) United Kingdom and its several Divisions—*Contd.*

England—Contd.

Poplar Medical Officer of Health.

Medical Officers of Health of the Local Government Board and of the following towns: Birkenhead, Birmingham, Blackburn, Bradford, Bristol, Cardiff, Derby, Halifax, Huddersfield, Leicester, Liverpool, Manchester, Newcastle-on-Tyne, Newport, Norwich, Nottingham, Preston, Salford, West Hartlepool, Wigan, Wolverhampton.

Ireland—

Department of Agriculture.
Registrar-General of Ireland.

Scotland—

Board of Agriculture.
Education Department.
Local Government Board.
Registrar-General, Scotland.
Edinburgh City Chamberlain.
" Medical Officer.
Aberdeen Medical Officer.
" Sanitary Inspector.
Glasgow Medical Officer.

(d) Authors, Publishers, &c.

Aftalion, Albert.
Angelescu, Dr. J. N.
Alcan, Felix.
Allen, George, & Co.
Arctowski, Henryk.
Bachelier, Louis.
Bachi, Riccardo.
Bacon, G. W., & Co.
Barriol, Alfred.
Bell, G., & Sons.
Bellom, Maurice.
Berger-Levrault & Co.
Bernis, Francisco.
Bertillon, Dr. J.
Bertinatti, F.
Black, A. & C.
Black, F. A.
Bontempelli, C. A.
Boutcher, Mortimore, & Co.
Brigstocke, A. Montagu.
Broomhall, G. J. S.
Cahill, J. R.
Callie, J. W. S.
Cambridge University Press.
Chalmers, Dr. A. K.
Chapman, Professor S. J.
Chapman & Hall.
Clarendon Press.
Clarke, Sir Ernest.
Colin, Librairie Armand.
Collins, G. N.
Collins, William, Sons & Co.
Constable, A., & Co.
Cook, Lady.
Cooper, Joseph.
Co-operative Union, Ltd.
Courtin, C. & H.
Deane, Albert B., F.C.I.S.
De Bray, A. J.
De Bussy, J. H.
Deichert'sche Verlagsbuchhandlung.
Delagrave, Librarie Ch.
Dick, G. W.
Dodd, Mead & Co.
Doin & Fils, O.
Dublin, Louis I.
Duckworth & Co.
Duclos, Maurice.
Dudfield, Dr., M.A.
Duncker & Humblot.
Eaton, H. W., & Sons.
Edgeworth, Prof. F. Y., M.A., F.B.A.
Effingham Wilson, Ltd.

Donations, Year 1913-14—Contd.

(b) Authors, Publishers, &c.—Contd.

[illegible], W. F.
Eason, C.
Eve, H. T.
Eyre & Spottiswoode.
[illegible]
[illegible]
[illegible]
Fischer, G.
[illegible]
[illegible]
Frowde, H.
[illegible]
Ginn & Co.
Giard & Brière.
Gill, [illegible]
Giretti, [illegible]
Godfrey, Ernest H.
Gow, W. [illegible]
Green, W., & Son.
[illegible] W.
[illegible]
Guillaumin, [illegible]
Guttentag, J.
Guyot, Yves.
Harrap, G. G., & Co.
Heinemann, W.
[illegible]
Heymanns, Carl, Verlag.
Hodder & Stoughton.
Hoepli, Ulrico.
Hoffman, F. L.
Holt, Henry, & Co.
Houghton Mifflin Co.
Hutchins, Miss B. L.
Hythe, Viscount.
Insurance Publishing Co.
James, A. F. B. [illegible]
Johns Hopkins Press.
Johnston, R. M.
[illegible], S.
Kegan Paul & Co.
Keltie, J. Scott.
King, A. W. W.
King, P. S., & Son.
Knibbs, G. H., C.M.G.
[illegible], E. W.
[illegible], M. [illegible]
[illegible]
[illegible], S., & Co.
[illegible], H., Buchhandlung.
[illegible], E.
[illegible], P. D.
[illegible], J. F., Verlag.
Librairie Générale de Droit.
Lippincott, J. B., Co.
Lloyd's Register.
Longmans & Co.
[illegible], Giovanni.
Macara, Sir Charles W., Bart.
Macaulay, T. B.
[illegible], Arthur.
Macmillan & Co.
Magee, James D.
Mallet, Bernard, C.B.
March, Lucien.
Marcus & Webers, Verlag.
Marshall, A.
[illegible], Eugen.
Mathieson, F. C., & Sons.
Mayr, Dr. G. von.
Merttens, F.
Methorst, H. W.
Methuen & Co.
Misch & Thron.
Mitchell & Co.
Mohr, J. B. C.
Mookosseyev, V.
Morgan, P. C.
Mortara, Prof. Giorgio.
Murray, John.
Necco, Achille.
Nelson, T., & Sons.
Newsholme, Dr. A., C.B.
Neymarck, A.
Nixon, J. W.
Northern Publishing Co., Ltd.
Oxford University Press.
Paish, Sir George.
Paul, Stanley, & Co.
Petersilie, Dr. A.

During the Year 1913-14—Contd.

(d) **Authors, Publishers, &c.**—*Contd.*

Phelps, E. B., M.A.
Pierro, Luigi.
Pitman, Sir Isaac, & Sons.
Pixley & Abell.
Plon-Nourrit & Cie.
Price, L. L., M.A.
Putkammer & Mulbrecht.
Putnam's, G. P., Sons.
Raffalovich, Arthur.
Rew, R. H., C.B.
Ricci, Prof. Umberto.
Rivière, Marcel, & Co.
Roesli, Dr. E.
Ronald & Rodger.
Rosenbaum, S., M.Sc.
Roulleau, Gaston.
Routledge, George, & Sons.
Rozenraad, C.
Rubenstein, J. S.
Ryder, C. F.
Salaman, R. N.
Schiavi, Alessandro.
Schmidt, Arno.
Schmoller, Dr. G.
Schott, Dr. Sigmund.
Schuurmann, W. Elink.
Seyd, Richard.
Sheppard, W. F., Sc.D.
Shimmin, Arnold M.
Simpkin, Marshall & Co.
Smith, Elder & Co.
Snow, Dr., E. C.
Spalding, William F.
Stanuell, Charles A.
Stevenson, Dr. T. H. C.
Stilke, Herrn.
Stuart, C. A., Verrijn.
Sundborg, Gustav.
Sweet & Maxwell, Ltd.
Tattersall, William.
Taylor, Gerald C.
Teubner, B. G.
Thirring, Dr. Gustav.
Thompson, W. J., & Co.
Tomlin, F. Ferrier.
Turroni, Constantino B.
Unstead, J. F.
Urmson, Elliot, & Co.
Veit & Co.
Verney, Sir Harry, M.P.
Vincent, Sir Edgar.
Vivian, Younger & Bond.
Wacha, D. E.
Walker, Gilbert T.
Wallis, Percy.
Waxweiler, Prof. E.
Weddel & Co.
Whitelegge, Sir Arthur B., K.C.B.
Wiley, John, & Sons.
Willett, William.
Williams & Norgate.
Wohlin, Nils.
Wood, Frances.
Wood, Sir H. T.
Woodworth, R. S.
Yerbury, John E.
Yule, G. Udny, M.A.

(e) **Societies, &c. (British).**

Accountants & Auditors, Society of.
Actuaries, Institute of.
Agricultural Organisation Society.
Anthropological Institute.
Arts, Royal Society of.
Bankers, Institute of.
Board of Guardians for Relief of Jewish Poor.
Bradford Chamber of Commerce.
British Association.
Business Statistics Co., Ltd.
Cambridge University Press.
Central Association of Accountants.
Channel Tunnel Co., Ltd.
Charity Organisation Society.
Chartered Accountants, Institute of.

During the Year 1913–14—*Contd.*

(e) **Societies, &c. (British)**—*Contd.*

Civil Engineers, Institution of.
Co-operative Wholesale Societies, Ltd.
Co-operative Union, Ltd.
Corporation of Foreign Bondholders.
Council of the United Synagogue.
East India Association.
Eugenics Education Society.
Fabian Society.
Free Trade Union.
Garton Foundation.
Garden Cities and Town Planning Association.
Glasgow Royal Philosophical Society.
Howard Association.
Imperial Institute.
Incorporated Accountants' Society.
Iron and Steel Institute.
Lawes Agricultural Trust.
Liverpool Chamber of Commerce.
,, Economic and Statistical Society.
London Chamber of Commerce.
,, Library.
,, School of Economics.
Manchester Statistical Society.
Medical Officers of Health, Incorporated Society of.
Navy League.
Peabody Donation Fund.
Royal Agricultural Society.
,, Asiatic Society.
,, College of Physicians.
,, ,, Surgeons.
,, Colonial Institute.
,, Economic Society.
,, Geographical Society.
,, Institution of Great Britain.
,, Meteorological Society.
,, Society, Edinburgh.
,, ,, London.
,, United Service Institution.
Sanitary Institute of Great Britain.
Society of Comparative Legislation.
,, for Propagation of the Gospel in Foreign Parts.
Sociological Society.
Statistical and Social Inquiry Society of Ireland.
Stock Exchange.
Surveyors' Institution.
Tariff Commission.
United Patternmakers' Association.
United Society of Boilermakers & Iron Shipbuilders.
University College, London.
Women's Industrial Council.

(f) **Periodicals, &c. (British).** *The Editors of*—

Accountant.
Agricultural Economist.
Associated Accountants' Journal.
Athenæum.
Australasian World.
Bankers' Magazine.
Bradshaw's Railway Manual.
Britannic Review.
Broomhall's Weekly Corn Trade News.
Browne's Export List.
Colliery Guardian.
Commercial World.
Co-partnership.
Economic Review.
Economist, The.
Finance Chronicle.
Financial Review of Reviews.
Fireman.
Illuminating Engineer.
Insurance Record.
Investors' Monthly Manual.

[illegible] Y [illegible]

Periodicals, [illegible] British [illegible] *Contd.*

Lighting World.
Machinery Market.
Nature.
Policy Holder.
Political Quarterly.
Post Magazine.
Public Health.

S[illegible]
S[illegible]
S[illegible] Week.
S[illegible] W[illegible] Annual.
S[illegible] Year-book.

HARRISON AND SONS, PRINTERS IN ORDINARY TO HIS MAJESTY, ST. MARTIN'S LANE.

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Royal Statistical Society,
London
Journal. Series A (General)

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